

Product Specification

XBLW CD4011

Quad 2-input Nand Gate

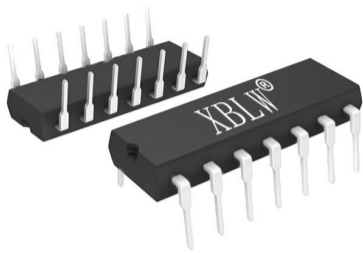
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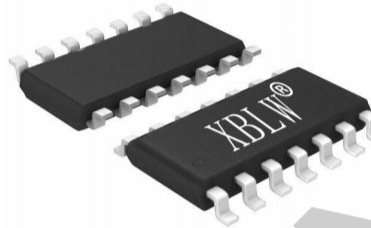
Description

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.

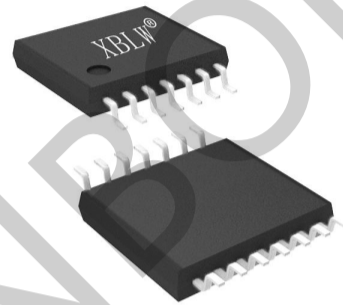
It operates over a recommended VDD power supply range of 3 V to 15 V referenced to VSS (usually ground). Unused inputs must be connected to VDD, VSS, or another input.



DIP-14



SOP-14



TSSOP-14

Feature

- 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

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW CD4011BE	DIP-14	CD4011BE	Tube	1000Pcs/Box
XBLW CD4011BDTR	SOP-14	CD4011B	Tape	2500Pcs/Reel
XBLW CD4011BTDTR	TSSOP-14	CD4011B	Tape	3000Pcs/Reel

Block Diagram And Pin Description

Block Diagram

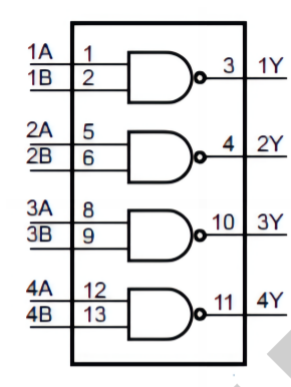
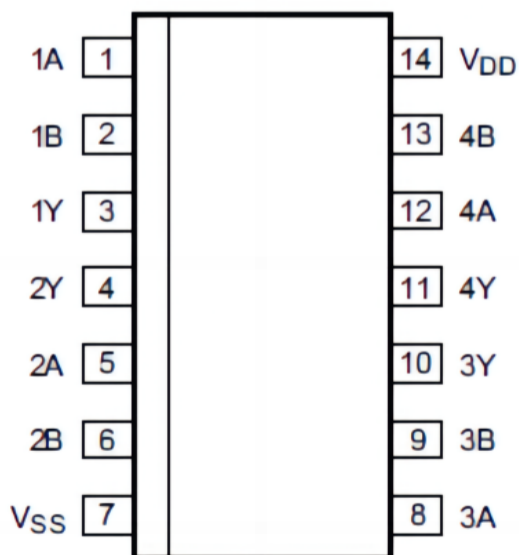


Figure 1 . Functional diagram



Figure 2 . Logic diagram (one gate)

Pin Configurations



PinDescription

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 (0 V)
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

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.

Electrical Parameter

Absolute Maximum Ratings

(Voltages are referenced to V_{SS} (ground=0 V) , 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		

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

Electrical Characteristics

DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$ voltages are referenced to V_{SS} (ground= 0 V) , unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb}= 25^{\circ}\text{C}$			Unit
		V_O	V_{IN}	V_{DD}	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	-	-	± 1	uA

DC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb} = -40^{\circ}\text{C}$		$T_{amb} = +85^{\circ}\text{C}$		$T_{amb} = +125^{\circ}\text{C}$		Unit
		V_o	V_{IN}	V_{DD}	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	-	0, 5	5	-	0.25	-	7.5	-	7.5	μA
		-	0, 10	10	-	0.5	-	15	-	15	μA
		-	0, 15	15	-	1	-	30	-	30	μA
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	-	± 1	-	± 1	-	± 1	μA

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}	see Figure 4	$V_{DD}= 5\text{ V}$	-	125	250	ns
			$V_{DD}= 10\text{V}$	-	60	120	ns
			$V_{DD}= 15\text{V}$	-	45	90	ns
transition time	t_{THL}, t_{TLH}	see Figure 4	$V_{DD}= 5\text{ V}$	-	100	200	ns
			$V_{DD}= 10\text{V}$	-	50	100	ns
			$V_{DD}= 15\text{V}$	-	40	80	ns
Input capacitance	C_1	any input		-	5	7.5	pF

Testing Circuit

AC Testing Circuit

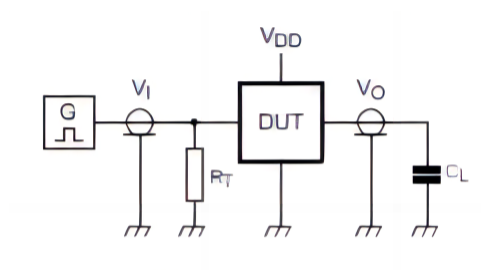


Figure 3 . Test circuit for switching times

Definitions for testcircuit:

DUT= DeviceUnder 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

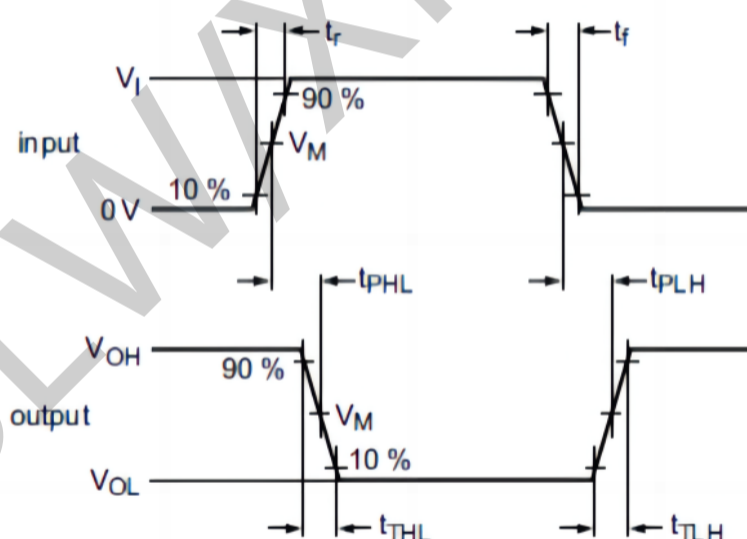


Figure 4 . Propagation delay, output transition time

Measurement Points

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

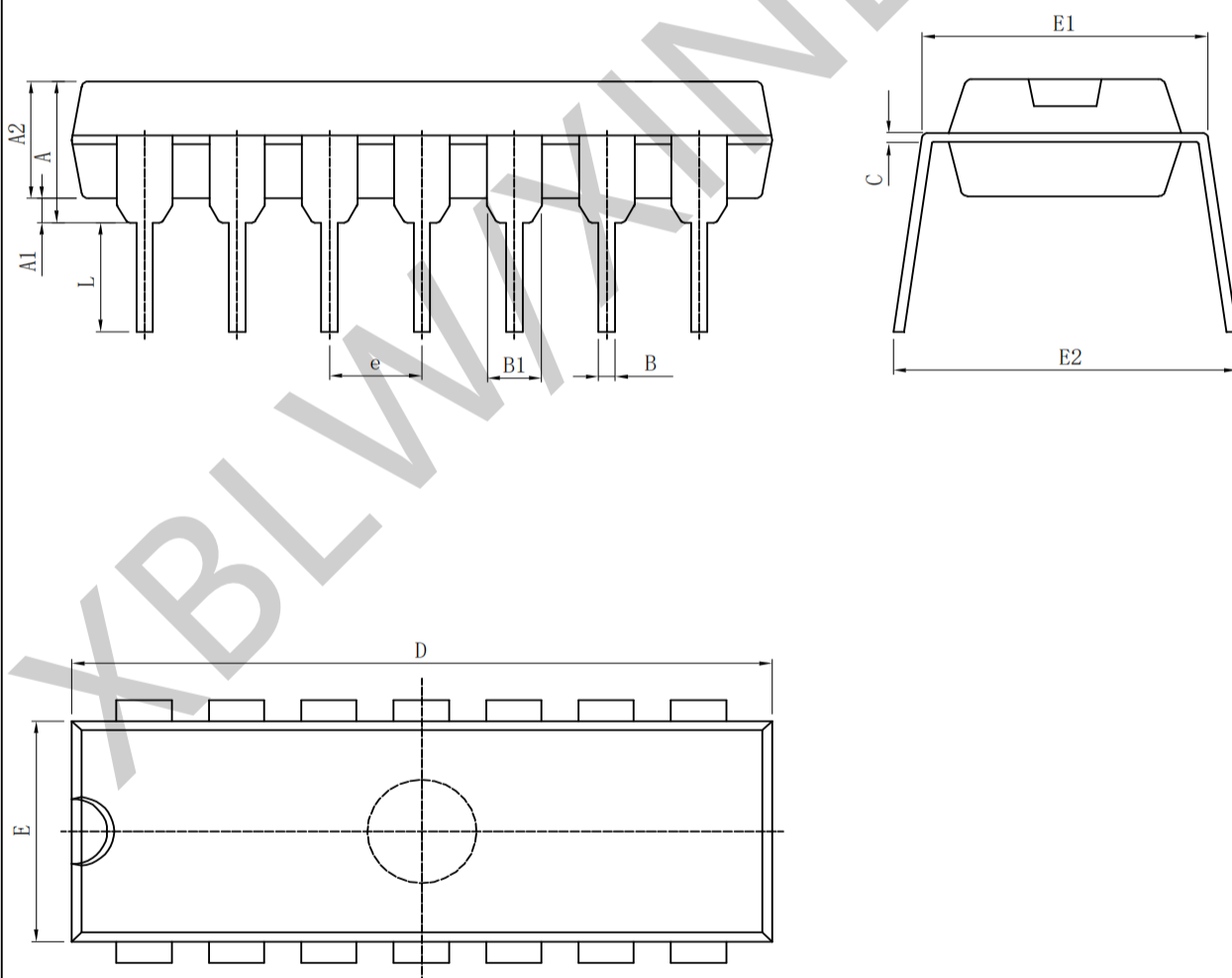
Test Data

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

Package Information

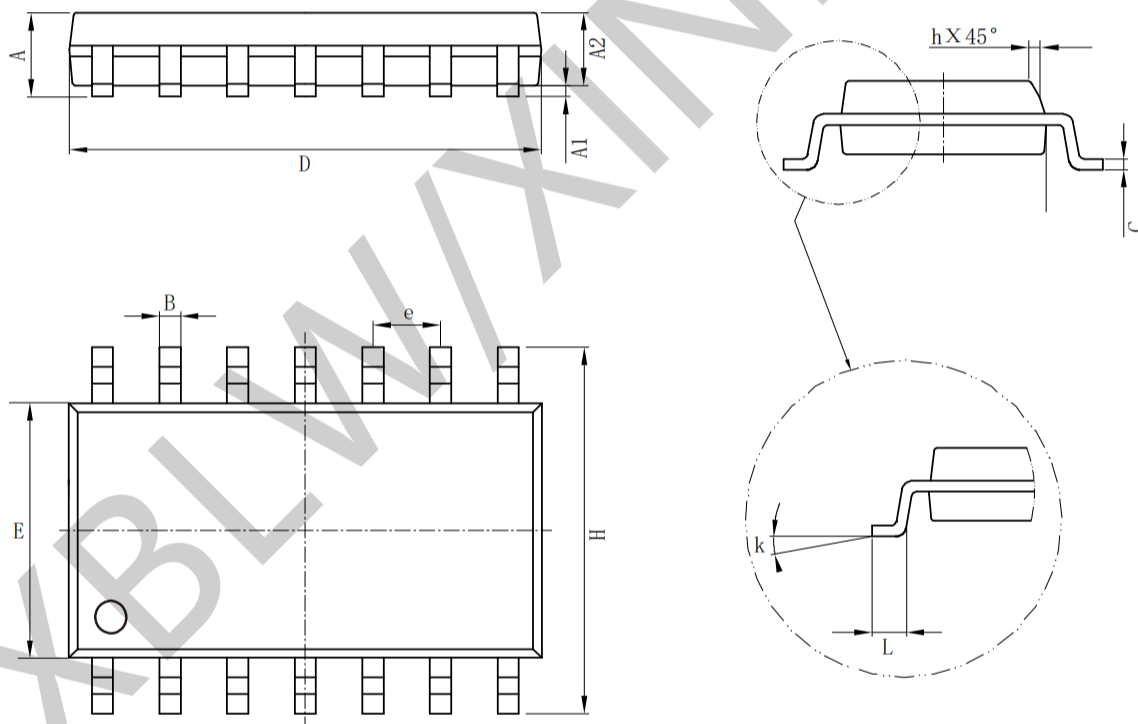
· DIP-14

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



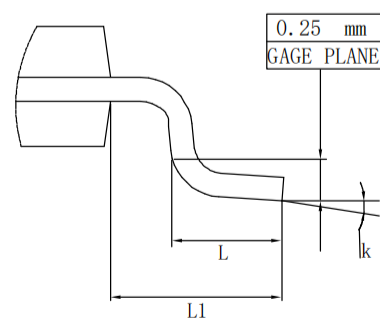
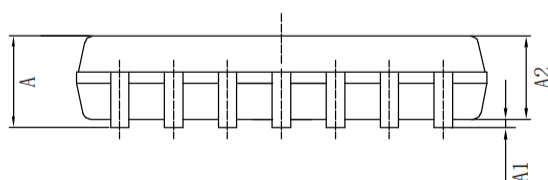
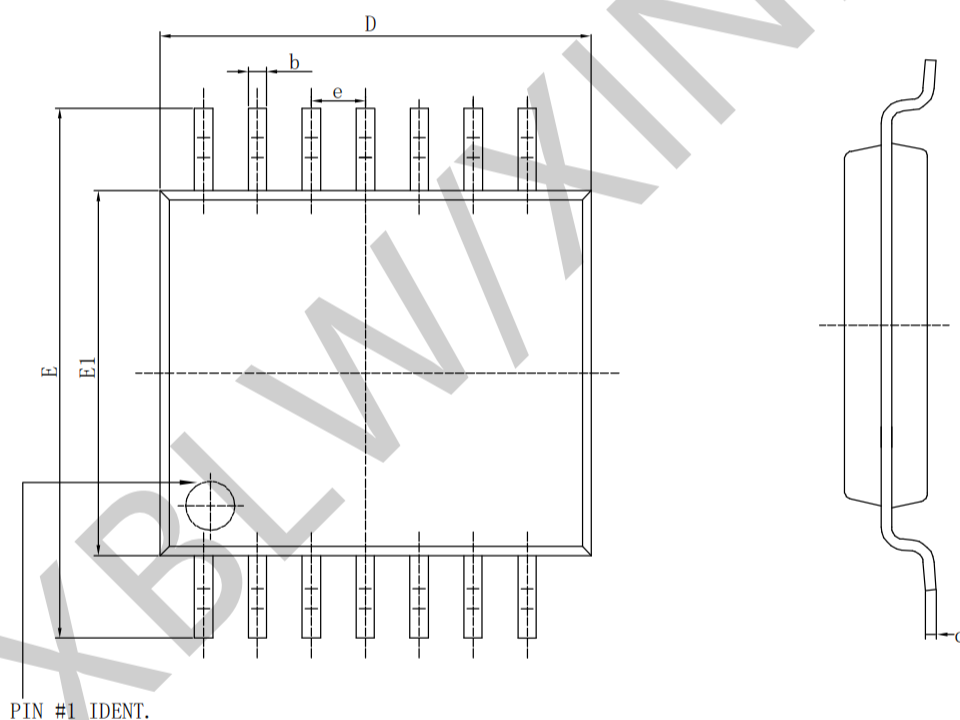
· SOP-14

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	1.350	1.750	A	0.050	0.068
A1	0.100	0.250	A1	0.004	0.009
A2	1.100	1.650	A2	0.040	0.060
B	0.330	0.510	B	0.010	0.020
C	0.190	0.250	C	0.007	0.009
D	8.550	8.750	D	0.330	0.340
E	3.800	4.000	E	0.150	0.150
e	1.27		e	0.05	
H	5.800	6.200	H	0.220	0.240
h	0.250	0.500	h	0.009	0.020
L	0.400	1.270	L	0.015	0.050
k	8° (max)		k	8° (max)	



· TSSOP-14

Symbol	Size		Dimensions In Millimeters		Symbol	Size		Dimensions In Inches	
			Min (mm)	Max (mm)				Min (in)	Max (in)
A				1.200	A				0.047
A1			0.050	0.150	A1			0.002	0.006
A2			0.800	1.050	A2			0.031	0.041
b			0.190	0.300	b			0.007	0.012
c			0.090	0.200	c			0.004	0.0089
D			4.900	5.100	D			0.193	0.201
E			6.200	6.600	E			0.244	0.260
E1			4.300	4.500	E1			0.169	0.176
e			0.65		e			0.0256	
L			0.450	0.750	L			0.018	0.030
L1			1.00		L1			0.039	
k			0°	8°	k			0°	8°



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