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XINBOLE

Product Specification

XBLW - CD4066

Quad Bilateral Switches

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Description

The CD4066 provides four single-pole, single-throw analog switch functions. Each switch has two input/output terminals (nY and nZ) and an active HIGH enable input (nE). When nE is LOW, the analog switch is turned off.

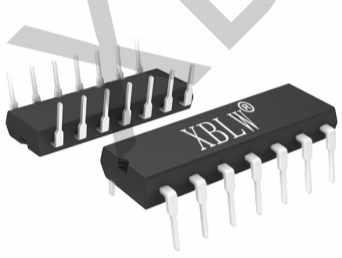
The CD4066 is pin compatible with the CD4016 but exhibits a much lower ON resistance. In addition the ON resistance is relatively constant over the full input signal range.

Features

- Wide supply voltage range from 3V to 9V
- Fully static operation
- 5V and 9V parametric ratings
- Standardized symmetrical output characteristics
- Inputs and outputs are protected against electrostatic effects
- Specified from -40°C to +125°C
- Packaging information: DIP14/SOP14/TSSOP14

Applications

- Analog signal switching and multiplexing:signal gating, modulators, squelch controls,demodulators, choppers, commutating switches
- Digital signal switching and multiplexing
- Analog-to-digital and digital-to-analog conversions
- Digital control of frequency, impedance, phase, and analog-signal gain
- Building automation



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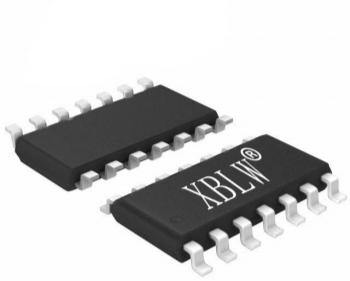

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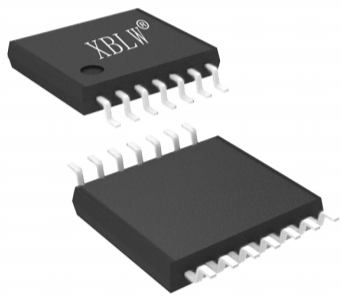


TSSOP-14

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW CD4066BE	DIP-14	CD4066BE	Tube	1000Pcs/Box
XBLW CD4066BDTR	SOP-14	CD4066B	Tape	2500Pcs/Reel
XBLW CD4066BTDTR	TSSOP-14	CD4066B	Tape	3000Pcs/Reel

Block Diagram

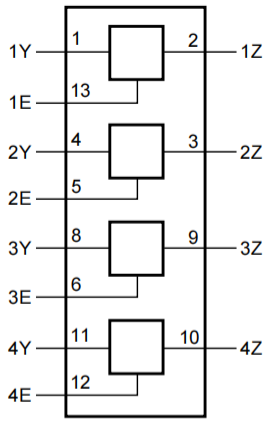


Figure 1. Functional diagram

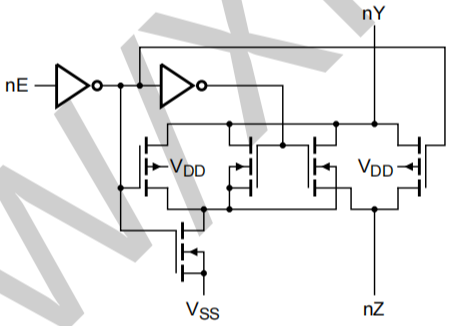
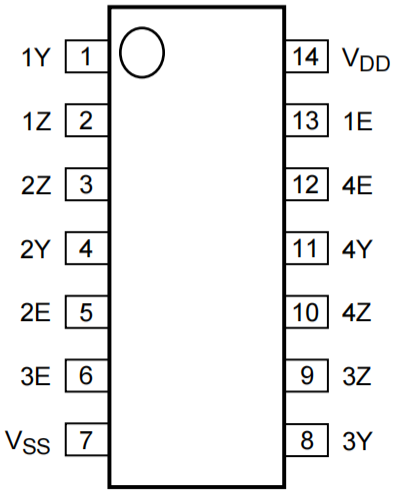


Figure 2. Logic diagram (one switch)

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	1Y	independent input or output
2	1Z	independent input or output
3	2Z	independent input or output
4	2Y	independent input or output
5	2E	enable input (active HIGH)
6	3E	enable input (active HIGH)
7	V_{SS}	ground (0V)
8	3Y	independent input or output
9	3Z	independent input or output
10	4Z	independent input or output
11	4Y	independent input or output
12	4E	enable input (active HIGH)
13	1E	enable input (active HIGH)
14	V_{DD}	supply voltage

Function Table

Input	Switch
nE	
H	ON
L	OFF

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

Electrical Parameter

Absolute Maximum Ratings

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{DD}	-	-0.5	+12	V
input voltage	V_I	-	-0.5	V_{DD}+0.5	V
input clamping current	I_{IK}	V_I<0.5V or V_I>V_{DD}+0.5V	-	±10	mA
input/output current	$I_{I/O}$	-	-	±10	mA
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
		10s, SOP/TSSOP	260		°C

Recommended Operating Conditions

(T_{amb}=25°C; R_L=10kΩ; C_L=50pF; nE=V_{DD}; Vis=V_{DD}=5V.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	5	9	V
ambient temperature	T_{amb}	in free air	-40	-	+125	°C
input voltage	V_I	-	0	-	V_{DD}	V
Disable output time （High level→turnoff）	t_{PHZ}	nE to nZ ornE tonY	-	80	160	ns
Disable output time （Low level→turnoff）	t_{PLZ}	nE to nZ ornE tonY	-	80	160	ns
Enable output time （turnoff→high/low level）	t_{PZH}, t_{PZL}	-	-	45	90	ns
input capacitance	C_I	-	-	-	7.5	pF

Electrical Characteristics

DC Characteristics 1

(T_{amb}=25°C, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T_{amb}=25°C			Unit
				Min.	Typ.	Max.	
supply current	I_{DD}	V_I=V_{DD} or V_{SS}, I_O=0A	V_{DD}=5V	-	-	1.0	uA
			V_{DD}=9V	-	-	2.0	uA
HIGH-level input voltage	V_{IH}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	3.5	-	-	V
			V_{DD}=9V, V_O=0.5V or 8V	7.0	-	-	V
LOW-level input voltage	V_{IL}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	-	-	1.5	V
			V_{DD}=9V, V_O=0.5V or 8V	-	-	3.0	V
input leakage current	I_I	V_I=0V or 9V, V_{DD}=9V		-	-	1.0	uA
ON resistance (rail)	R_{ON}	V_I=0V to V_{DD}-V_{EE}	V_{DD}-V_{EE}=5V	-	350	2500	Ω
			V_{DD}-V_{EE}=9V	-	80	245	Ω
		V_I=0V	V_{DD}-V_{EE}=5V	-	115	340	Ω
			V_{DD}-V_{EE}=9V	-	50	160	Ω
		V_I=V_{DD}-V_{EE}	V_{DD}-V_{EE}=5V	-	120	365	Ω
			V_{DD}-V_{EE}=9V	-	65	200	Ω
ON resistance mismatch between channels	△ R_{ON}	V_I=0V to V_{DD}-V_{EE}	V_{DD}-V_{EE}=5V	-	25	-	Ω
			V_{DD}-V_{EE}=9V	-	10	-	Ω

Note: On resistance waveform and test circuit see Figure 9 and Figure 10.

DC Characteristics 2

(T_{amb}=-40°C to +85°C, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T_{amb}=-40°C		T_{amb}=+85°C		Unit
				Min.	Max.	Min.	Max.	
supply current	I_{DD}	V_I=V_{DD} or V_{SS}, I_O=0A	V_{DD}=5V	-	1.0	-	7.5	uA
			V_{DD}=9V	-	2.0	-	15.0	uA
HIGH-level input voltage	V_{IH}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	3.5	-	3.5	-	V
			V_{DD}=9V, V_O=0.5V or 8V	7.0	-	7.0	-	V
LOW-level input voltage	V_{IL}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	-	1.5	-	1.5	V
			V_{DD}=9V, V_O=0.5V or 8V	-	3.0	-	3.0	V
input leakage current	I_I	V_I=0V or 9V, V_{DD}=9V		-	-	-	1.0	uA

DC Characteristics 3

(T_{amb}=-40°C to +125°C, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)		T_{amb}=-40°C		T_{amb}=+125°C		Unit
				Min.	Max.	Min.	Max.	
supply current	I_{DD}	V_I=V_{DD} or V_{SS}, I_O=0A	V_{DD}=5V	-	1.0	-	7.5	uA
			V_{DD}=9V	-	2.0	-	15.0	uA
HIGH-level input voltage	V_{IH}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	3.5	-	3.5	-	V
			V_{DD}=9V, V_O=0.5V or 8V	7.0	-	7.0	-	V
LOW-level input voltage	V_{IL}	|I_O|<1uA	V_{DD}=5V, V_O=0.5V or 4.5V	-	1.5	-	1.5	V
			V_{DD}=9V, V_O=0.5V or 8V	-	3.0	-	3.0	V
input leakage current	I_I	V_I=0V or 9V, V_{DD}=9V		-	-	-	1.0	uA

AC Characteristics 1

(T_{amb}=25°C, V_{EE}=V_{SS}=0V, t_r, t_f≤20ns, C_L=50pF, R_L=10kΩ, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay time	t_{PHL}	nY to nZ; nZ tonY; see Figure 4	V_{DD}=5V	-	10	20	ns
			V_{DD}=9V	-	5	10	ns
LOW to HIGH Propagation delay	t_{PLH}	nY to nZ; nZ tonY; see Figure 4	V_{DD}=5V	-	10	20	ns
			V_{DD}=9V	-	5	10	ns
HIGH to OFF-state Propagation delay	t_{PHZ}	nE tonY, nZ; see Figure 5	V_{DD}=5V	-	80	160	ns
			V_{DD}=9V	-	65	130	ns
LOW to OFF-state Propagation delay	t_{PLZ}	nE tonY, nZ; see Figure 5	V_{DD}=5V	-	80	160	ns
			V_{DD}=9V	-	70	140	ns
OFF-state to HIGH propagation delay	t_{PZH}	nE tonY, nZ; see Figure 5	V_{DD}=5V	-	40	80	ns
			V_{DD}=9V	-	20	40	ns
OFF-state to LOW Propagation delay	t_{PZL}	nE tonY, nZ; see Figure 5	V_{DD}=5V	-	45	90	ns
			V_{DD}=9V	-	20	40	ns

AC Characteristics 2

(T_{amb}=25°C, V_{EE}=V_{SS}=0V, V_I=0.5V_{DD} (p-p), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Square wave distortion	d_{sin}	see Figure 6; R_L=10kΩ; C_L=15pF; channel ON; f_i=1kHz	V_{DD}=5V	0.25	-	-	%
			V_{DD}=9V	0.04	-	-	%
any two channel crosstalk	f_{ct}	V_{DD}=9V, see note2		1	-	-	MHz
crosstalk voltage (nE to nY to nZ)	V_{ct}	see Figure 7; R_L=10kΩ; C_L=15pF; $\overline{E}$ or Sn=V_{DD} (square-wave)		50	-	-	mV
OFF frequency	f_{OFF}	V_{DD}=9V, see note3		1	-	-	MHz
conduction frequency	f_{ON}	V_{DD}=5V, see note4		-	-	-	MHz
		V_{DD}=9V, see note4		90	-	-	MHz

Note:

[1] f_i is biased at 0.5V_{DD}; V_I=0.5V_{DD} (p-p).

[2] R_L=1kΩ; 20logVos/Vis=-50dB, see Figure 8.

[3] R_L=1kΩ; C_L=5pF, channel off, 20logVos/Vis=-50dB, see Figure 6.

[4] R_L=1kΩ; C_L=5pF, channel on, 20logVos/Vis=-3dB, see Figure 6.

Testing Circuit

AC Testing Circuit 1

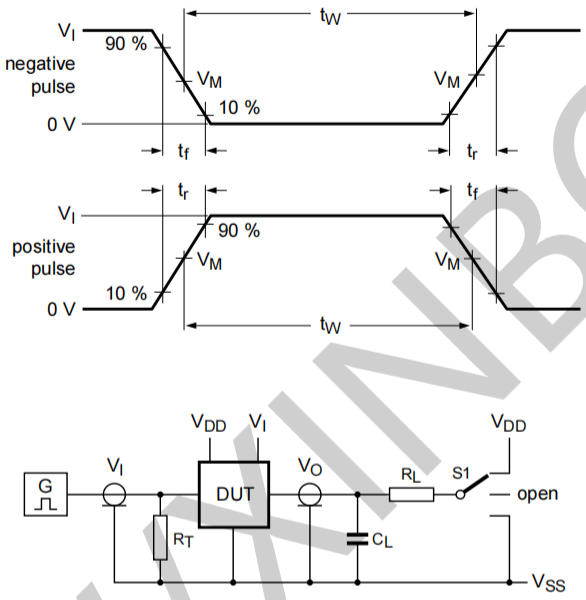


Figure 3. Test circuit for switching times

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.

R_L=Load resistance.

AC Testing Waveforms

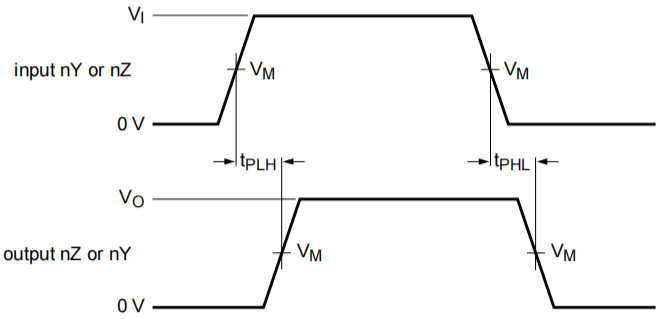


Figure 4. nY or nZ to nZ or nY propagation delays

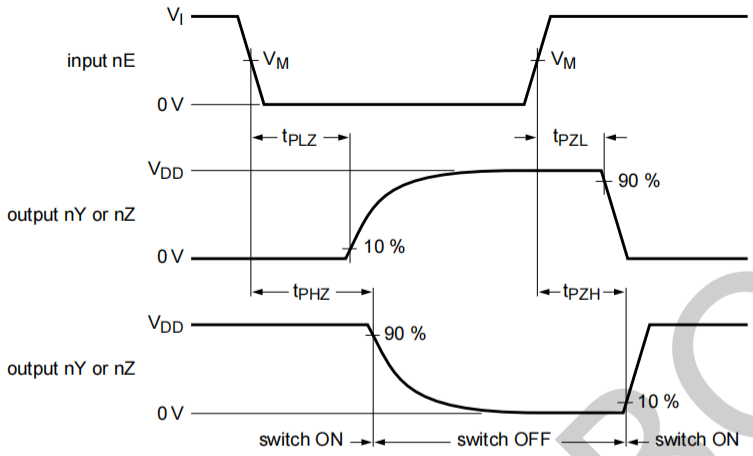


Figure 5. Enable and disable times

AC Testing Circuit 2

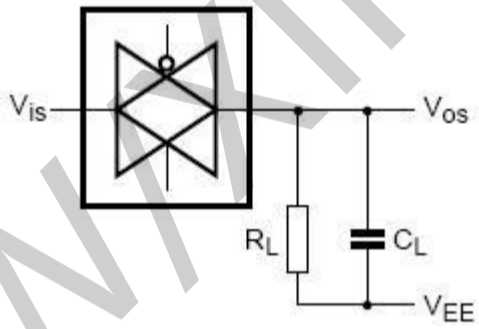


Figure 6. Square wave distortion degree of cut-off frequency and conduction frequency test pattern

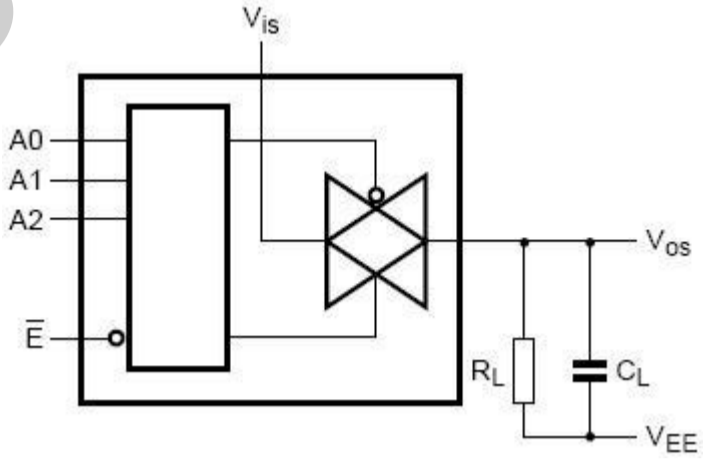


Figure 7. Crosstalk logical input/output test

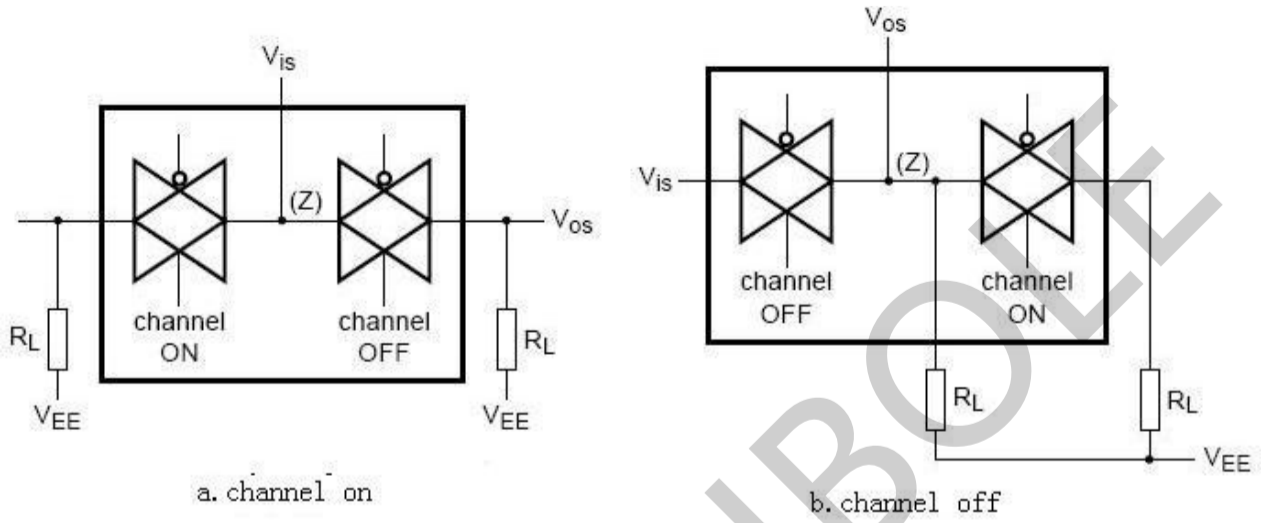
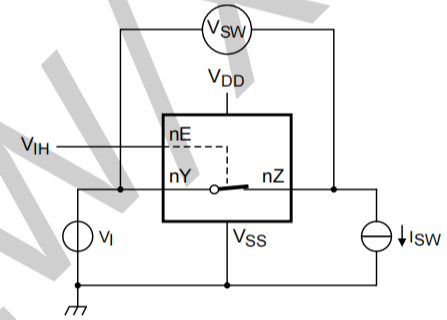


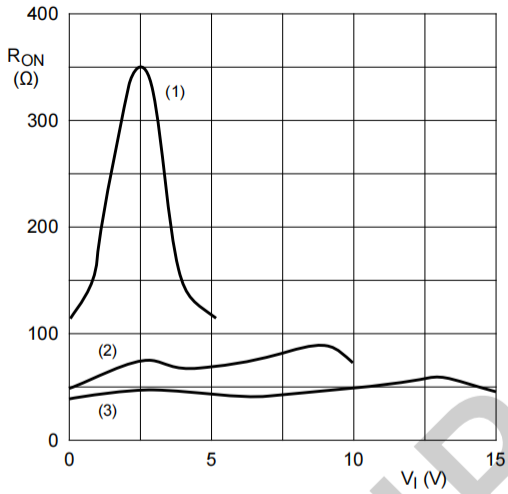
Figure 8. Inter channel Crosstalk

On Resistance Waveform And Test Circuit



$R_{ON} = V_{SW} / I_{SW}$.

Figure 9. Test circuit for measuring R_{ON}



I_{SW} = 200 μA.
(1) V_{DD} = 5 V
(2) V_{DD} = 10 V
(3) V_{DD} = 15 V

Figure 10. Typical R_{ON} as a function of input voltage

Measurement Points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
3V to 9V	0.5×V_{DD}	0.5×V_{DD}

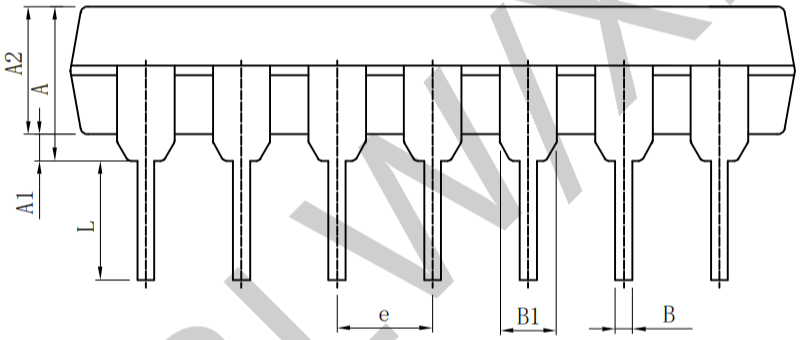
Test Data

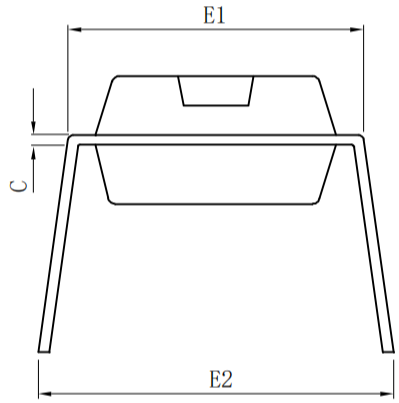
Test	Input		Load		Switch
	V_{is}	t_r,t_f	C_L	R_L	
t_{PHL}	V_{EE}	20ns	50pF	10kΩ	V_{DD}
t_{PLH}	V_{DD}	20ns	50pF	10kΩ	V_{EE}
t_{PZH}, t_{PHZ}	V_{DD}	20ns	50pF	10kΩ	V_{EE}
t_{PZL}, t_{PLZ}	V_{EE}	20ns	50pF	10kΩ	V_{DD}
others	pulse	20ns	50pF	10kΩ	open

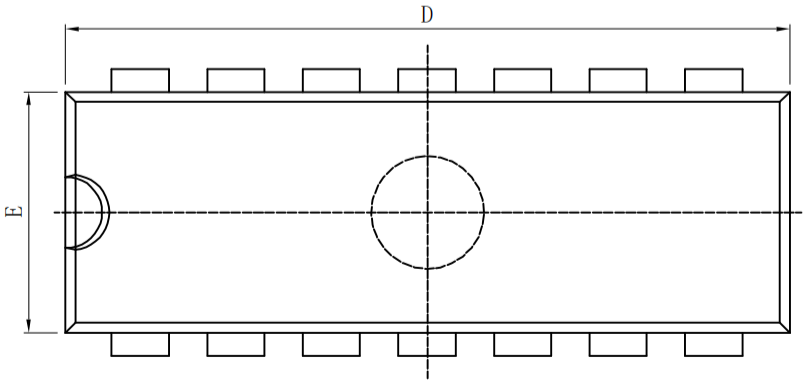
Package Information

· DIP-14

Size / Symbol	Dimensions In Millimeters		Size / 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







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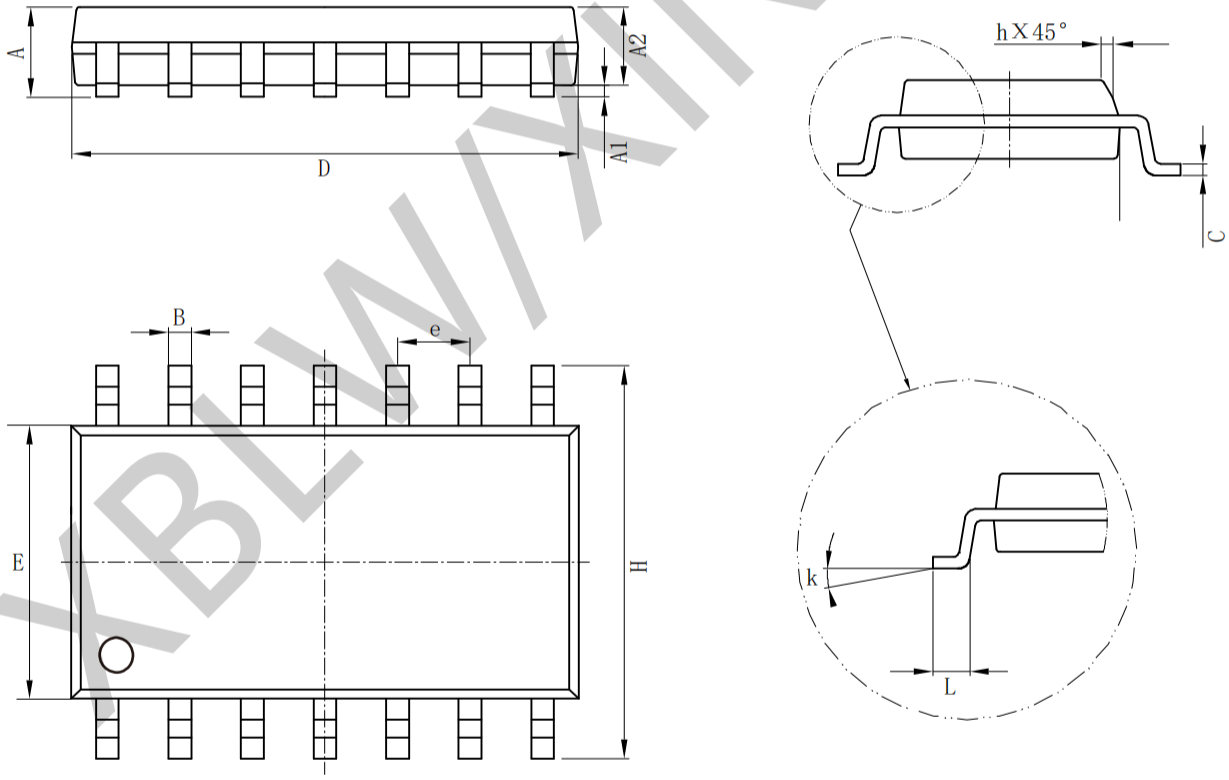
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	1.350	1.750	A	0.050	0.068
A1	0.100	0.250	A1	0.004	0.009
A2	1.100	1.650	A2	0.040	0.060
B	0.330	0.510	B	0.010	0.020
C	0.190	0.250	C	0.007	0.009
D	8.550	8.750	D	0.330	0.340
E	3.800	4.000	E	0.150	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)	



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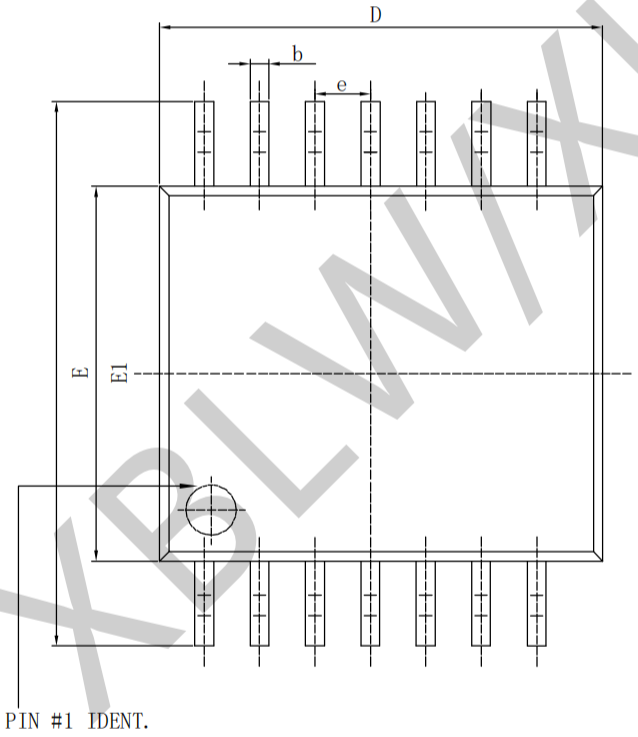
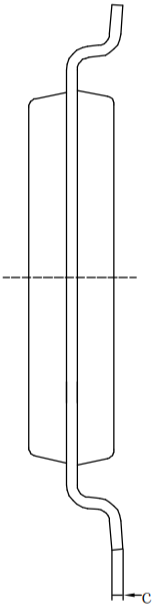
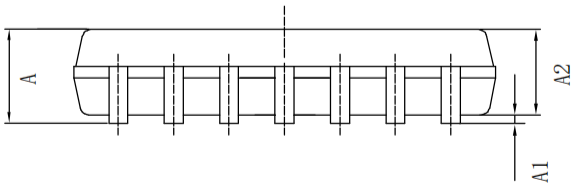
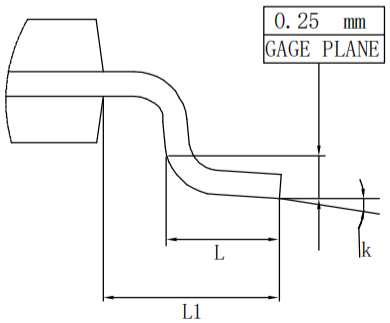
Size / Symbol	Dimensions In Millimeters		Size / Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A		1.200	A		0.047
A1	0.050	0.150	A1	0.002	0.006
A2	0.800	1.050	A2	0.031	0.041
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.0089
D	4.900	5.100	D	0.193	0.201
E	6.200	6.600	E	0.244	0.260
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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