芯 伯 乐®
XINBOLE

Product Specification

XBLW CD4528
### Dual Monostable Multivibrator

RoHS

Description

The CD4528 is a dual retriggerable-resetable monostable multivibrator. Each multivibrator has an active LOW input (n$\overline{A}$), and active HIGH input (nB), an active LOW clear direct input (n$\overline{CD}$), an output (nQ) and its complement (n$\overline{Q}$), and two external timing component connecting pins (nCEXT, always connected to ground, and nREXT/CEXT).

An external timing capacitor (C_{EXT}) must be connected between nCEXT and nREXT/CEXT and an external resistor (R_{EXT}) must be connected between nREXT/CEXT and V $_{DD}$. The output pulse duration is determined by the external timing components C_{EXT} and R_{EXT}. A HIGH-to-LOW transition on n$\overline{A}$ when nB is LOW or a LOW-to-HIGH transition on nB when n$\overline{A}$ is HIGH produces a positive pulse (LOW-HIGH-LOW) on nQ and a negative pulse (HIGH-LOW-HIGH) on n$\overline{Q}$ if the n$\overline{CD}$ is HIGH. A LOW on n$\overline{CD}$ forces nQ LOW, n$\overline{Q}$ HIGH and inhibits any further pulses until n$\overline{CD}$ is HIGH.

It operates over a recommended V_{DD} power supply range of 3V to 12V referenced to V_{SS} (usually ground).

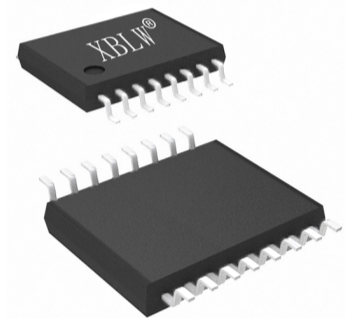Unused inputs must be connected to V_{DD}, V_{SS}, or another input.

Features

➢ Wide supply voltage range from 3V to 12V

➢ Fully static operation

➢ 5V and 10V parametric ratings

➢ Standardized symmetrical output characteristics

➢ Specified from -40℃ to +125℃

➢ Packaging information: DIP16/SOP16/TSSOP16
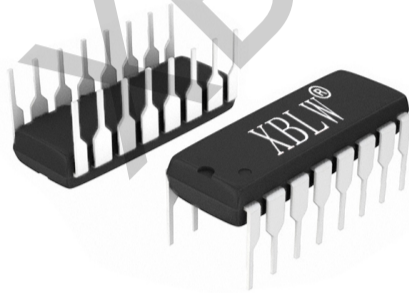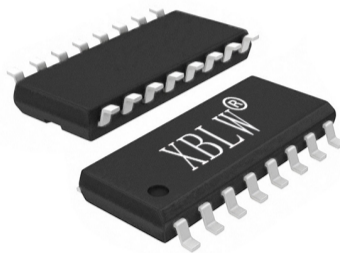
DIP-16   SOP-16   TSSOP-16

Ordering Information

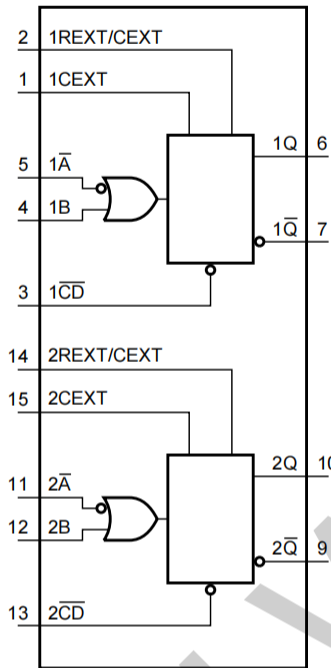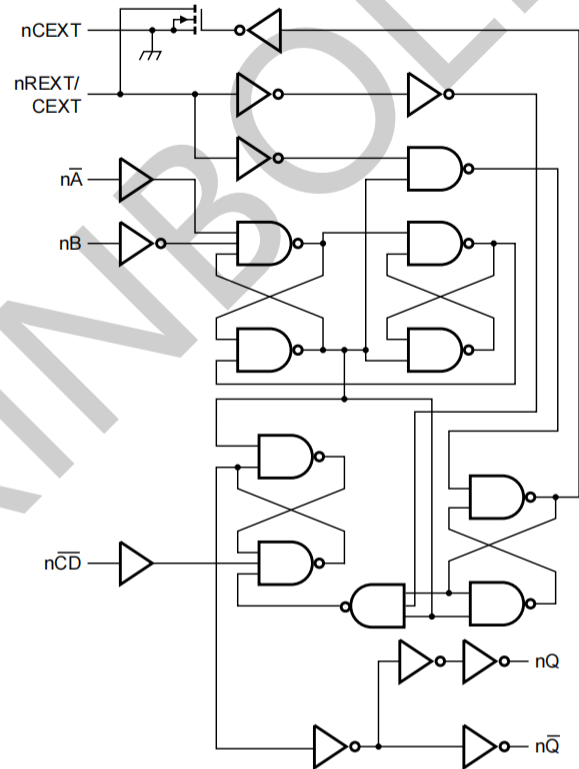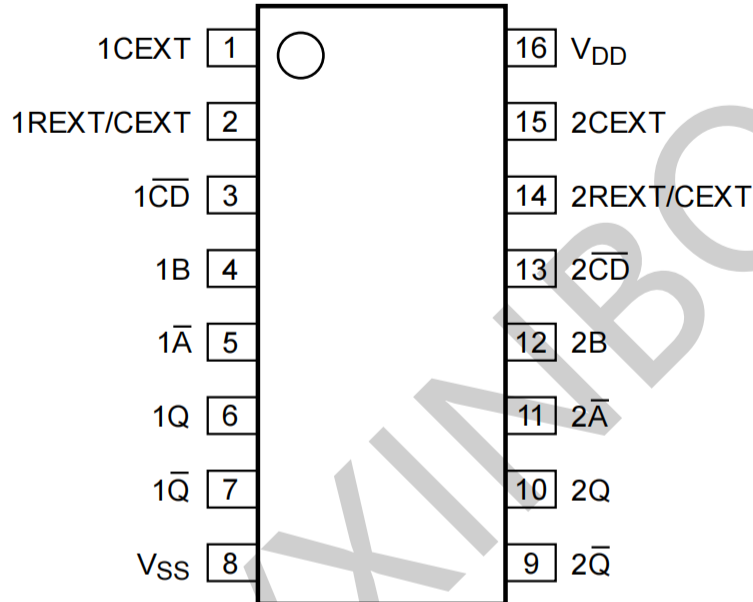| Product Model	Package Type	Marking	Packing	Packing Qty
XBLW CD4528BE	DIP-16	CD4528BE	Tube	1000Pcs/Box
XBLW CD4528BDTR	SOP-16	CD4528B	Tape	2500Pcs/Reel
XBLW CD4528BTDTR	TSSOP-16	CD4528B	Tape	3000Pcs/Reel

Block Diagram

Figure 1. Functional diagram

Figure 2. Logic diagram for one monostable multivibrator

Pin Configurations

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1CEXT       ┌1    ○    16┐  V_DD
1REXT/CEXT  ┌2         15┐  2CEXT
1CD         ┌3         14┐  2REXT/CEXT
1B          ┌4         13┐  2CD
1A          ┌5         12┐  2B
1Q          ┌6         11┐  2A
1Q          ┌7         10┐  2Q
V_SS        ┌8          9┐  2Q
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
Pin Description

Pin No.	Pin Name	Description
1	1CEXT	external capacitor connection (always connected to ground)
2	1REXT/ CEXT	external capacitor/resistor connection
3	1$\overline{CD}$	clear direct input (active LOW)
4	1B	input (LOW-to-HIGH triggered)
5	$\overline{1A}$	input (HIGH-to-LOW triggered)
6	1Q	output
7	$\overline{1Q}$	complementary output (active LOW)
8	V_SS	ground (0V)
9	$\overline{2Q}$	complementary output (active LOW)
10	2Q	output
11	$\overline{2A}$	input (HIGH-to-LOW triggered)
12	2B	input (LOW-to-HIGH triggered)
13	2$\overline{CD}$	clear direct input (active LOW)
14	2REXT/ CEXT	external capacitor/resistor connection
15	2CEXT	external capacitor connection (always connected to ground)
16	V_DD	supply voltage

Function Table

Input			Output	
n$\bar{A}$	nB	n$\bar{CD}$	nQ	n$\bar{Q}$
↓	L	H	⊓	⊔
H	↑	H	⊓	⊔
X	X	L	L	H

Note:

[1] H=HIGH voltage level; L=LOW voltage level; X=don't care;

[2] ↑=positive-going clock transition; ↓=negative-going transition;

[3] ⊓ =one HIGH level output pulse, with the pule width determined by C_{EXT} and R_{EXT};

[4] ⊔ =one LOW level output pulse, with the pulse width determined by C_{EXT} and R_{EXT}.

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	+14	V
DC input current	I_{IK}	anyone 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/TSSOP	260		

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	-	12	V
ambient temperature	T_{amb}	in free air	-40	-	+125	°C

Electrical Characteristics

DC Characteristics 1

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

Parameter	Symbol	Conditions			T_{amb}=25℃			Unit
		$|I_O|$(uA)	V_O(V)	V_{DD}(V)	Min.	Typ.	Max.	
supply current	I_{DD}	0	-	5	-	-	20	uA
		0	-	10	-	-	40	uA
LOW-level output current	I_{OL}	-	0.4	5	0.44	-	-	mA
		-	0.5	10	1.1	-	-	mA
HIGH-level output current	I_{OH}	-	2.5	5	-	-	-1.4	mA
		-	4.6	5	-	-	-0.44	mA
		-	9.5	10	-	-	-1.1	mA
LOW-level output voltage	V_{OL}	<1	-	5	-	-	0.05	V
		<1	-	10	-	-	0.05	V
HIGH-level output voltage	V_{OH}	<1	-	5	4.95	-	-	V
		<1	-	10	9.95	-	-	V
LOW-level input voltage	V_{IL}	<1	-	5	-	-	1.5	V
		<1	-	10	-	-	3	V
HIGH-level input voltage	V_{IH}	<1	-	5	3.5	-	-	V
		<1	-	10	7	-	-	V
input leakage current	I_I	-	-	12	-	-	±1.0	uA

DC Characteristics 2

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

Parameter	Symbol	Conditions			T_{amb}=-40°C		T_{amb}=+85°C		T_{amb}=+125°C		Unit
		$|I_O|$ (uA)	V_O (V)	V_{DD} (V)	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	0	-	5	-	20	-	150	-	150	uA
		0	-	10	-	40	-	300	-	300	uA
LOW-level output current	I_{OL}	-	0.4	5	0.52	-	0.36	-	0.36	-	mA
		-	0.5	10	1.3	-	0.9	-	0.9	-	mA
HIGH-level output current	I_{OH}	-	2.5	5	-	-1.7	-	-1.1	-	-1.1	mA
		-	4.6	5	-	-0.52	-	-0.36	-	-0.36	mA
		-	9.5	10	-	-1.3	-	-0.9	-	-0.9	mA
LOW-level output voltage	V_{OL}	<1	-	5	-	0.05	-	0.05	-	0.05	V
		<1	-	10	-	0.05	-	0.05	-	0.05	V
HIGH-level output voltage	V_{OH}	<1	-	5	4.95	-	4.95	-	4.95	-	V
		<1	-	10	9.95	-	9.95	-	9.95	-	V
LOW-level input voltage	V_{IL}	<1	-	5	-	1.5	-	1.5	-	1.5	V
		<1	-	10	-	3	-	3	-	3	V
HIGH-level input voltage	V_{IH}	<1	-	5	3.5	-	3.5	-	3.5	-	V
		<1	-	10	7	-	7	-	7	-	V
input leakage current	I_I	-	-	12	-	±1.0	-	±1.0	-	±1.0	uA

AC Characteristics

(T_{amb}=25°C, V_{SS}=0V, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay	t_{PHL}	$n\overline{A}$ or nB to $n\overline{Q}$; see Figure 5	V_{DD}=5V	-	140	280	ns
			V_{DD}=10V	-	50	100	ns
		$n\overline{CD}$ to nQ; see Figure 5	V_{DD}=5V	-	105	210	ns
			V_{DD}=10V	-	40	85	ns
LOW to HIGH propagation delay	t_{PLH}	$n\overline{A}$ or nB to nQ; see Figure 5	V_{DD}=5V	-	155	305	ns
			V_{DD}=10V	-	60	115	ns
		$n\overline{CD}$ to $n\overline{Q}$; see Figure 5	V_{DD}=5V	-	120	240	ns
			V_{DD}=10V	-	50	105	ns
transition time	t_t	nQ, $n\overline{Q}$; see Figure 5	V_{DD}=5V	-	60	120	ns
			V_{DD}=10V	-	30	60	ns
recovery time	t_{rec}	$n\overline{CD}$ to $n\overline{A}$ or nB; see Figure 6	V_{DD}=5V	0	-75	-	ns
			V_{DD}=10V	0	-30	-	ns
set-up time	t_{su}	$n\overline{CD}$ to $n\overline{A}$ or nB; see Figure 6	V_{DD}=5V	0	-105	-	ns
			V_{DD}=10V	0	-40	-	ns
pulse width	t_w	$n\overline{A}$ LOW; minimum width; see Figure 6	V_{DD}=5V	50	25	-	ns
			V_{DD}=10V	30	15	-	ns
		nB HIGH; minimum width; see Figure 6	V_{DD}=5V	50	25	-	ns
			V_{DD}=10V	30	15	-	ns
		$n\overline{CD}$ LOW; minimum width; see Figure 6	V_{DD}=5V	60	30	-	ns
			V_{DD}=10V	35	15	-	ns
		nQ or $n\overline{Q}$; R_{EXT}=5kΩ; C_{EXT}=15pF; see Figure 6	V_{DD}=5V	-	235	-	ns
			V_{DD}=10V	-	155	-	ns
		nQ or $n\overline{Q}$; R_{EXT}=10kΩ; C_{EXT}=1nF; see Figure 6	V_{DD}=5V	-	5.45	-	us
			V_{DD}=10V	-	4.95	-	us
pulse width variation	Δt_W	nQ output variation over temperature range	V_{DD}=5V	-	±3	-	%
			V_{DD}=10V	-	±2	-	%
		nQ output variation over voltage range V_DD±5%	V_{DD}=5V	-	±2	-	%
			V_{DD}=10V	-	±1	-	%
external timing resistor	R_{EXT}	see Figure 4	V_{DD}=5V	5	-	2	MΩ
			V_{DD}=10V	5	-	2	MΩ
external timing capacitor	C_{EXT}	see Figure 4	V_{DD}=5V	no limits			-
			V_{DD}=10V	no limits			-
input capacitance	C_I	-	-	-	-	7.5	pF

Note:

[1] t_t is the same as t_{TLH} and t_{THL}.

[2] For other R_{EXT}, C_{EXT} combinations and C_{EXT}<0.01uF, see Figure 4.

[3] For other R_{EXT}, C_{EXT} combinations and C_{EXT}>0.01uF, use formula t_W=K×R_{EXT}×C_{EXT}.

where: t_W=output pulse width (s);

R_{EXT}=external timing resistor (Ω);

C_{EXT}=external timing capacitor (F);

K=0.42 for V_{DD}=5V;

K=0.32 for V_{DD}=10V;

K=0.30 for V_{DD}=15V.

[4] T_{amb}=-40°Cto +85°C; Δt_W is referenced to t_W at T_{amb}=25°C.
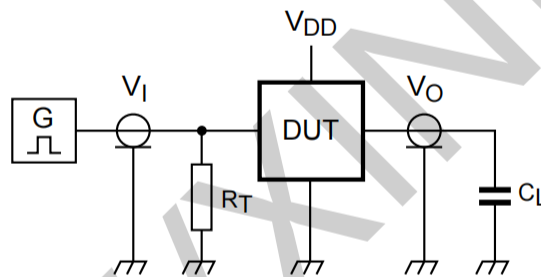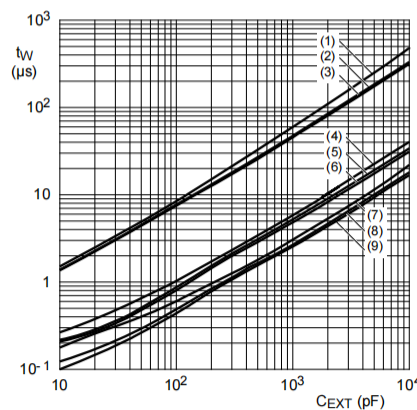
Testing Circuit

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

(1) R_{EXT} = 100 kΩ, V_{DD} = 5 V.
(2) R_{EXT} = 100 kΩ, V_{DD} = 10 V.
(3) R_{EXT} = 100 kΩ, V_{DD} = 15 V.
(4) R_{EXT} = 10 kΩ, V_{DD} = 5 V.
(5) R_{EXT} = 10 kΩ, V_{DD} = 10 V.
(6) R_{EXT} = 10 kΩ, V_{DD} = 15 V.
(7) R_{EXT} = 5 kΩ, V_{DD} = 5 V.
(8) R_{EXT} = 5 kΩ, V_{DD} = 10 V.
(9) R_{EXT} = 5 kΩ, V_{DD} = 15 V.

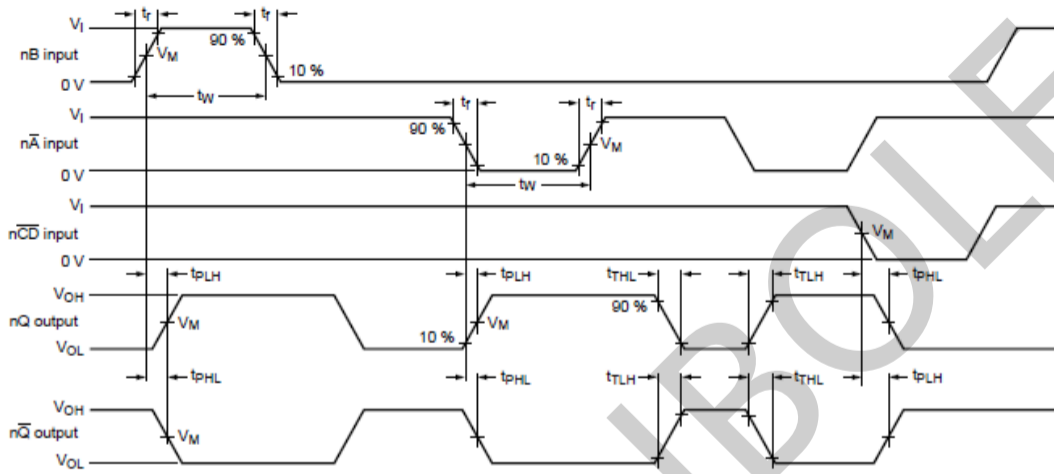Figure 4. Output pulse width (t_W) as a function of external timing capacitor (C_{EXT})

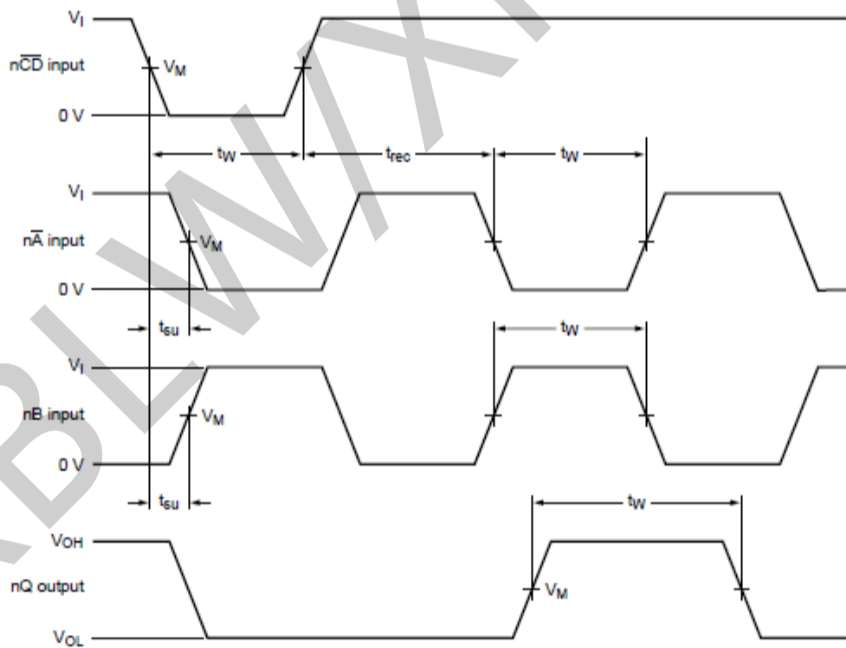Figure 5. Waveforms showing propagation delays and transition times

Figure 6. Waveforms showing minimum n $\overline{A}$, nB, and nQ pulse widths and set-up and recovery times

Measurement Points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
5V to 12V	$0.5 \times V_{DD}$	$0.5 \times V_{DD}$

Test Data

Supply voltage	Input		Load
V_{DD}	V_I	t_r , t_f	C_L
5V to 12V	V_{SS} or V_{DD}	≤ 20ns	50pF

Package Information

· DIP-16

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	18.80	19.20	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
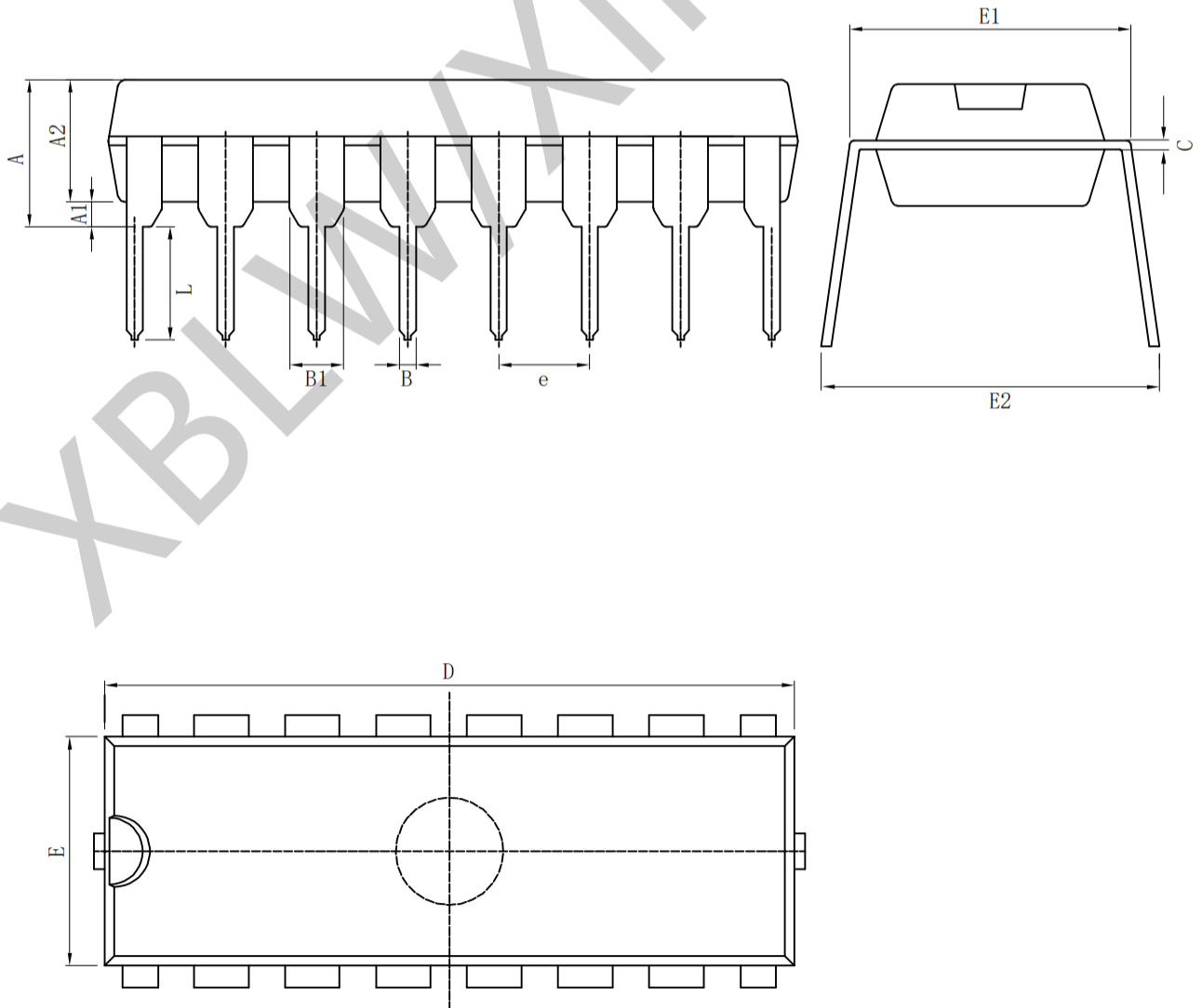
· SOP-16

Size Symbol	Dimensions In Millimeters			Size Symbol	Dimensions In Inches		
	Min(mm)	Nom(mm)	Max(mm)		Min(in)	Nom(in)	Max(in)
A	1.500	1.600	1.700	A	0.059	0.063	0.067
A1	0.100	0.150	0.250	A1	0.004	0.006	0.010
A2	1.400	1.450	1.500	A2	0.055	0.057	0.059
A3	0.600	0.650	0.700	A3	0.024	0.026	0.028
b	0.300	0.400	0.500	b	0.012	0.016	0.020
c	0.150	0.200	0.250	c	0.006	0.008	0.010
D	9.800	9.900	10.00	D	0.386	0.390	0.394
E	5.800	6.000	6.200	E	0.228	0.236	0.244
E1	3.850	3.900	3.950	E1	0.152	0.154	0.156
e	1.27(BSC)			e	0.050(BSC)		
L	0.500	0.600	0.700	L	0.020	0.024	0.028
L1	1.05(BSC)			L1	0.041(BSC)		
θ	0°	4°	8°	θ	0°	4°	8°
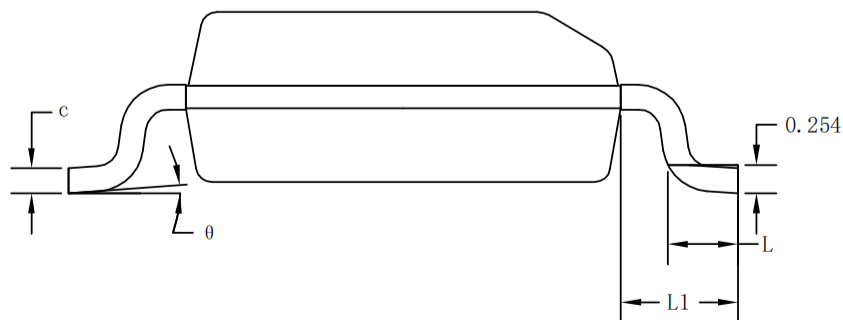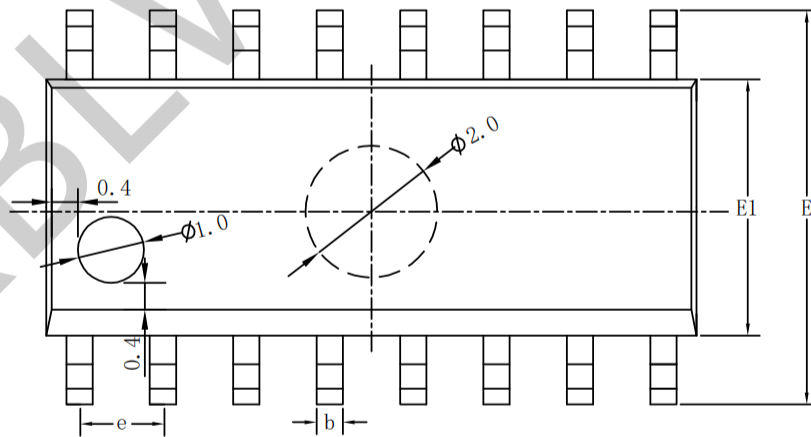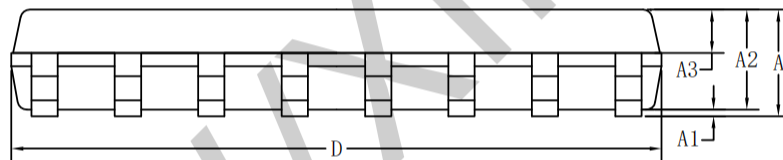
· TSSOP-16

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	4.480	E1	0.169	0.176
e	0.65(BSC)		e	0.0256(BSC)	
K	0°	8°	K	0°	8°
L	0.450	0.750	L	0.018	0.030
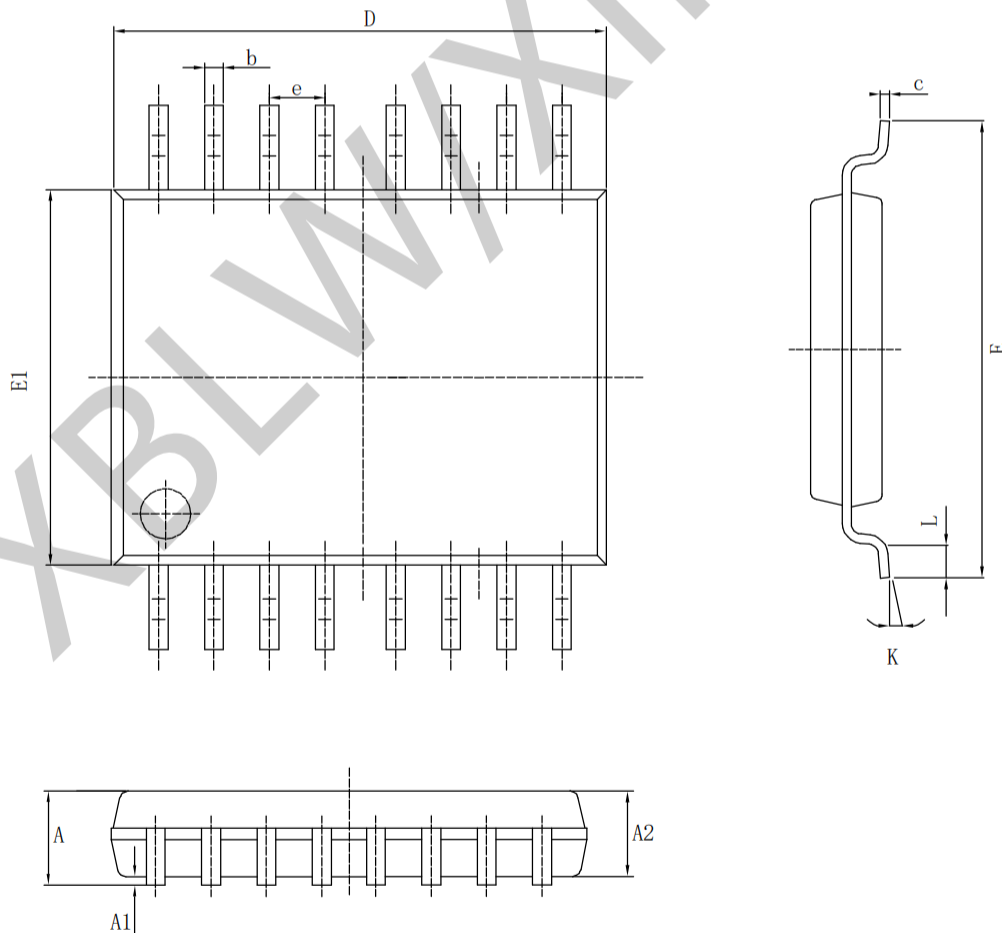
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