

Product Specification

XBLW CD4070

Quad 2-input Exclusive-or Gate

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Description

The CD4070 is a quad 2-input EXCLUSIVE-OR gate. The outputs are fully buffered for the highest noise immunity and pattern insensitivity to output impedance.

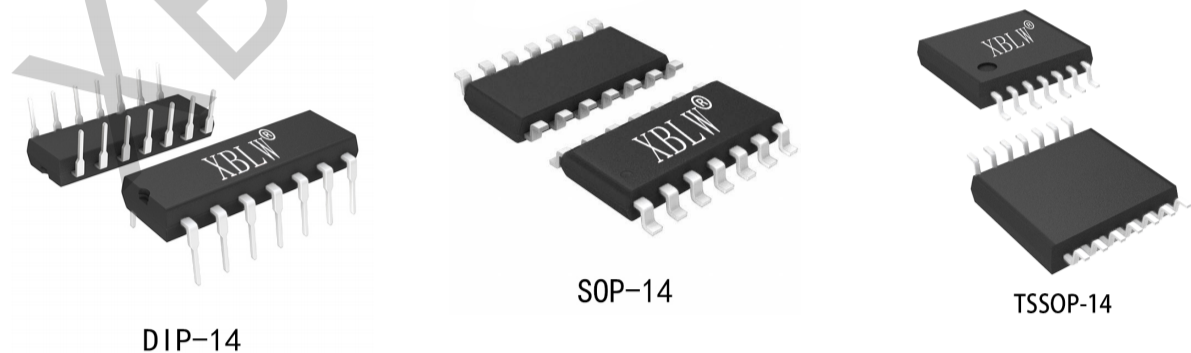
It operates over a recommended V_{DD} power supply range of 3V to 15V referenced to V_{SS} (usually ground). Unused inputs must be connected to V_{DD} , V_{SS} , or another input.

Features

- Wide supply voltage range from 3V to 15V
- Fully static operation
- 5V, 10V, and 15V parametric ratings
- Standardized symmetrical output characteristics
- Specified from -40°C to +125°C
- Packaging information: DIP14/SOP14/TSSOP14

Applications

- Logical Comparators
- Adders/Subtractors
- Parity Generators and Checkers



Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW CD4070BE	DIP-14	CD4070BE	Tube	1000Pcs/Box
XBLW CD4070BDTR	SOP-14	CD4070B	Tape	2500Pcs/Reel
XBLW CD4070BDTR	TSSOP-14	CD4070B	Tape	3000Pcs/Reel

Block Diagram

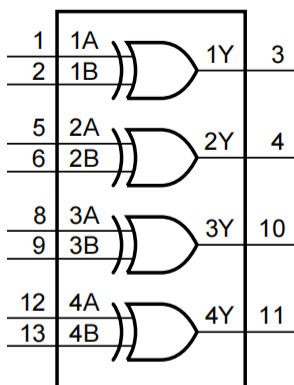


Figure 1. Functional diagram

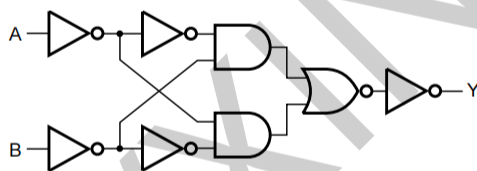
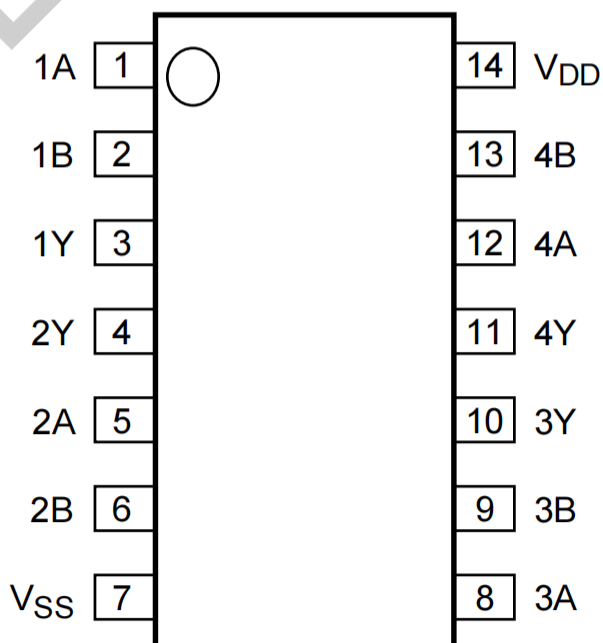


Figure 2. Logic diagram (one gate)

Pin Configurations



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 (0V)
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	L
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=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V _{DD}	-		-0.5	+18	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	-	15	V
ambient temperature	T_{amb}	in free air	-40	-	+125	°C

Electrical Characteristics

DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to V_{SS} (ground=0V), 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	-	-	1	uA
		-	0, 10	10	-	-	1	uA
		-	0, 15	15	-	-	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}	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_{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 V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb} = -40^{\circ}\text{C}$		$T_{amb} = +85^{\circ}\text{C}$		$T_{amb} = +125^{\circ}\text{C}$		Unit
		V_O	V_{IN}	V_{DD}	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	-	0, 5	5	-	1	-	7.5	-	7.5	μA
		-	0, 10	10	-	1	-	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}	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	-	± 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	$V_{DD}=5\text{V}$	-	140	280 ns
			$V_{DD}=10\text{V}$	-	65	130 ns
			$V_{DD}=15\text{V}$	-	50	100 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_i	any input	-	5	7.5	pF

Testing Circuit

AC Testing Circuit

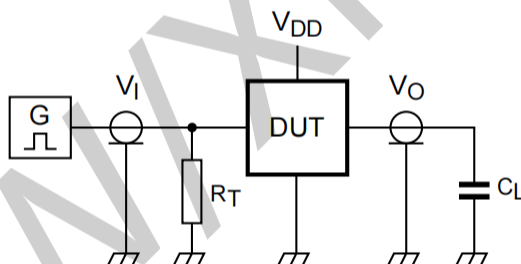


Figure 3. Test circuit for switching times

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

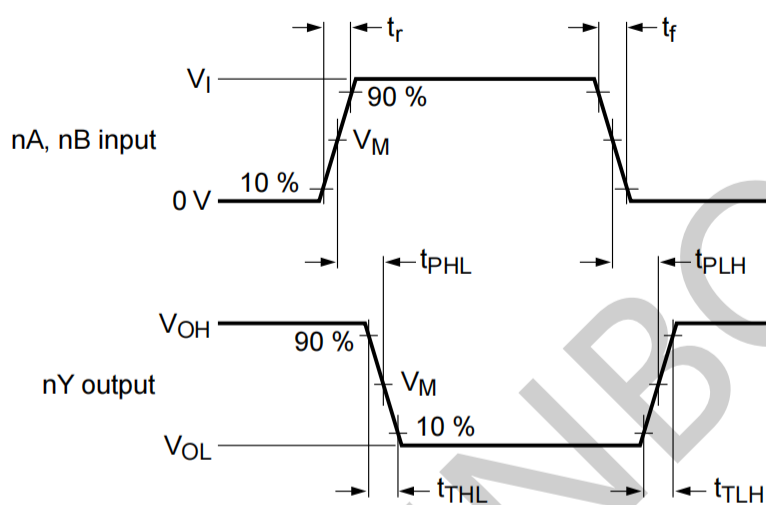


Figure 4. Input to output propagation delays and output transition times

Measurement Points

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

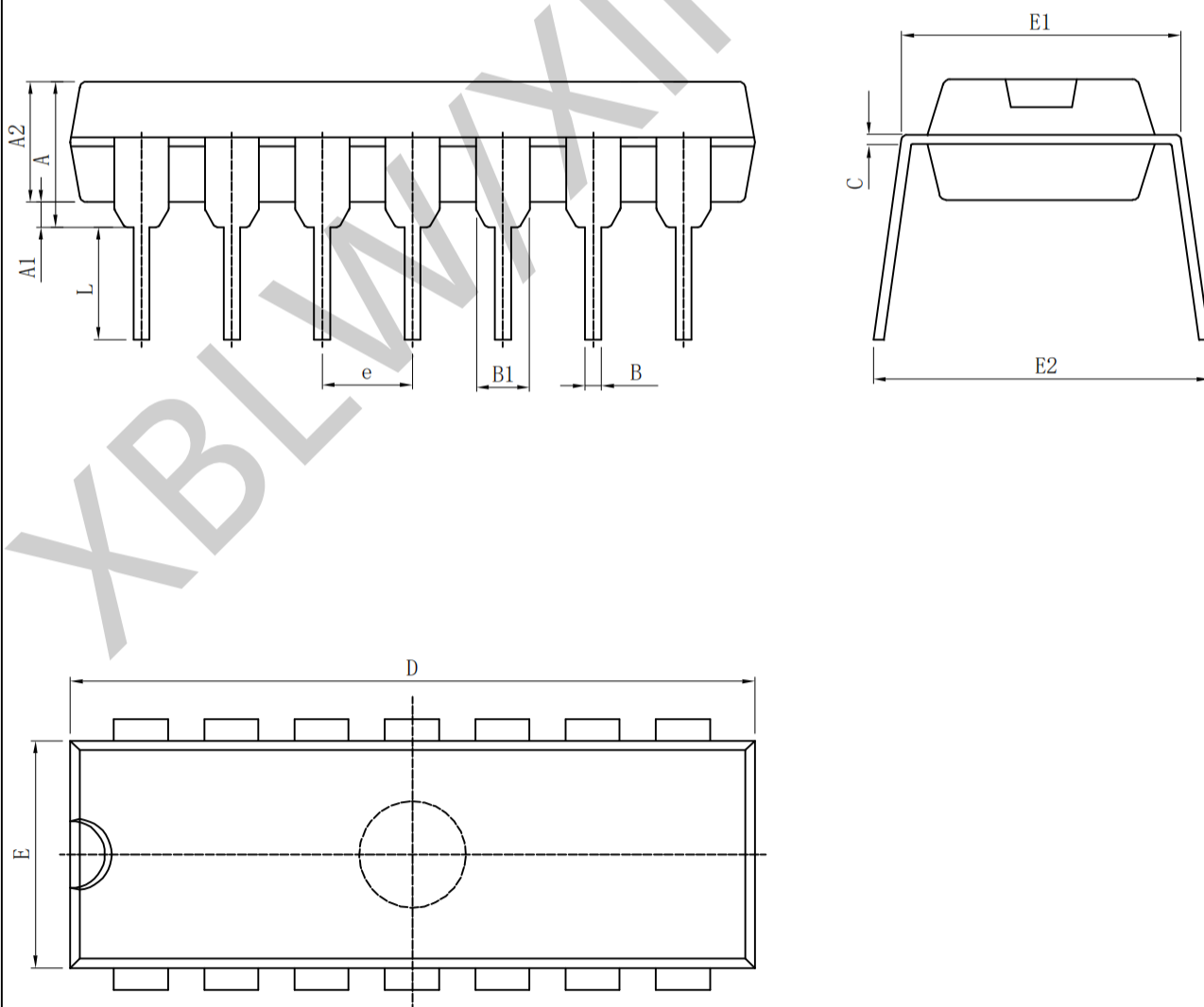
Test Data

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

Package Information

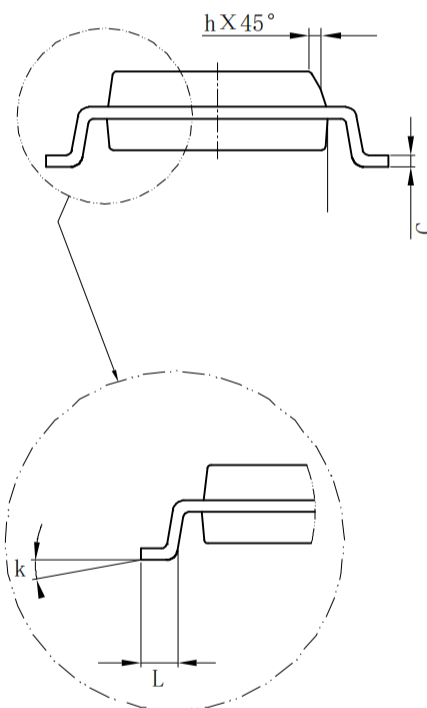
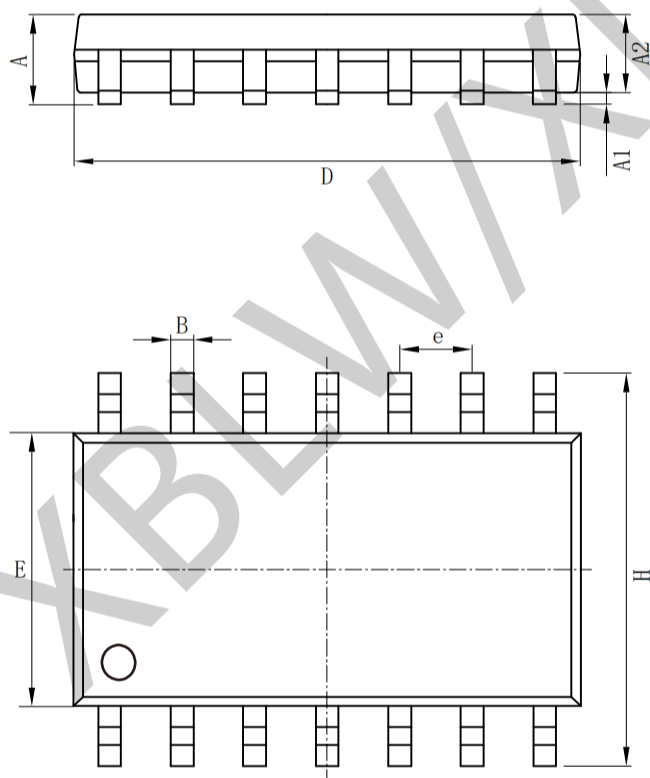
• DIP-14

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



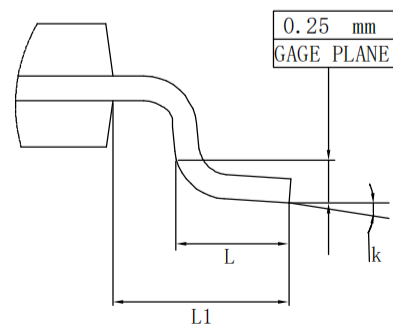
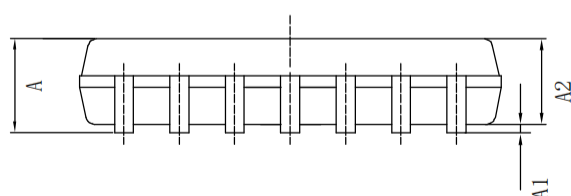
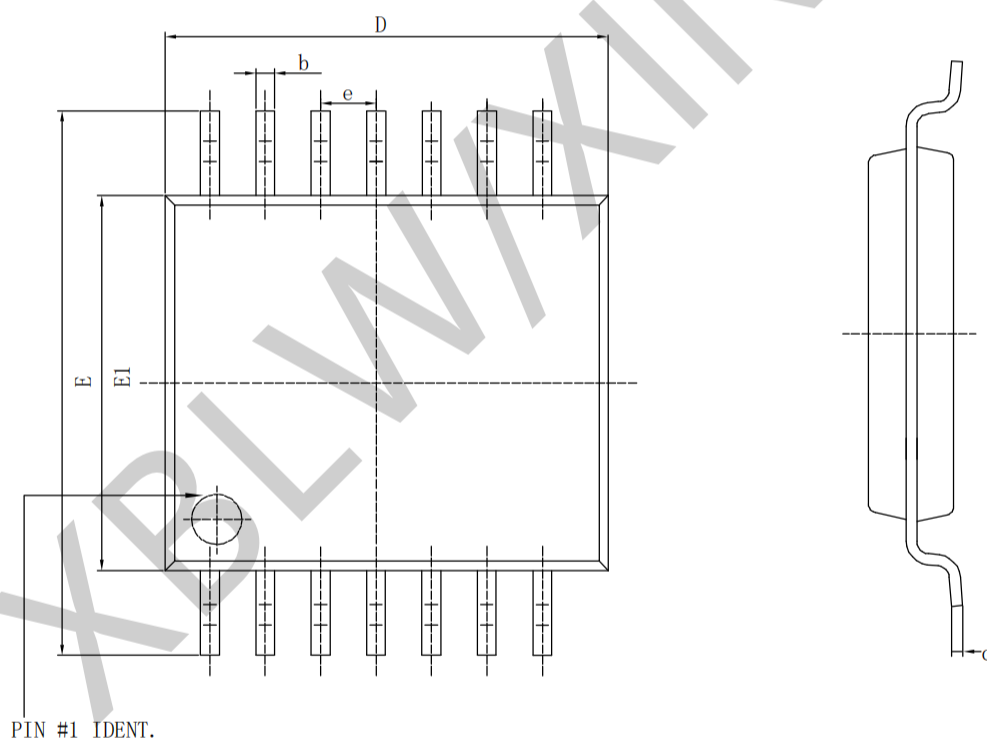
· SOP-14

Symbol	Size	Dimensions In Millimeters		Symbol	Size	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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