



# CD4097

## Dual 8-channel Analog Multiplexer/Demultiplexer

### Product Specification

**Specification Revision History:**

Version	Date	Description
2019-09-A1	2019-09	New
2021-12-A2	2021-12	Modify Ordering Information
2022-03-A3	2022-03	Modify ambient temperature to $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$ and add electrical characteristics of $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$



## 1、 General Description

The CD4097 is a dual 8-channel multiplexer having three binary control inputs A0, A1, A2 and an inhibit input ( $\bar{E}$ ). The inputs permit selection of one of eight pairs of switches. With  $\bar{E}$  HIGH all switches are in the high-impedance OFF-state, independent of A0 to A2.

The analog inputs/outputs (nY0 to nY7 and nZ) can swing between  $V_{DD}$  as a positive limit and  $V_{SS}$  as a negative limit.  $V_{DD}$  to  $V_{SS}$  may not exceed 15V.

### Features:

- Wide supply voltage range from 3V to 9V
- Fully static operation
- 5V and 9V parametric ratings
- Standardized symmetrical output characteristics
- Specified from -40°C to +105°C
- Packaging information: SOP24/TSSOP24

**Ordering Information:****Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
CD4097SA24.TB	SOP24	CD4097	30 PCS/tube	80 tube/box	2400 PCS/box	Dimensions of plastic enclosure: 15.4mm×7.5mm Pin spacing: 1.27mm
CD4097TA24.TB	TSSOP24	CD4097	62 PCS/tube	200 tube/box	12400 PCS/box	Dimensions of plastic enclosure: 7.8mm×4.4mm Pin spacing: 0.65mm

**Reel packing specifications:**

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
CD4097SA24.TR	SOP24	CD4097	1000 PCS/reel	2000 PCS/box	Dimensions of plastic enclosure: 15.4mm×7.5mm Pin spacing:1.27mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



## 2、Block Diagram And Pin Description

### 2.1、Block Diagram

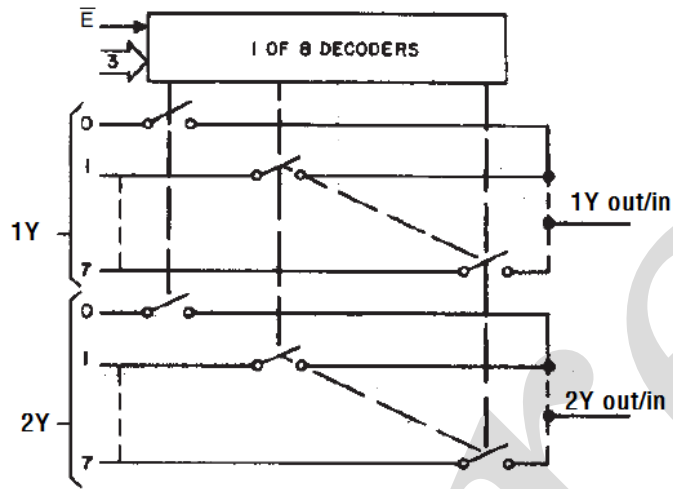
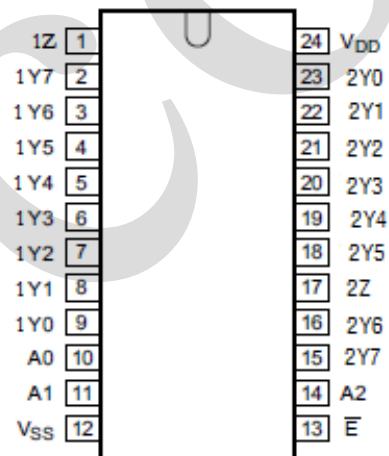


Figure 1. Functional diagram

### 2.2、Pin Configurations





## 2.3、Pin Description

Pin No.	Pin Name	Description
1	1Z	common input/output
2	1Y7	independent input/output
3	1Y6	independent input/output
4	1Y5	independent input/output
5	1Y4	independent input/output
6	1Y3	independent input/output
7	1Y2	independent input/output
8	1Y1	independent input/output
9	1Y0	independent input/output
10	A0	address input
11	A1	address input
12	V <sub>SS</sub>	ground (0V)
13	$\bar{E}$	enable input (active LOW)
14	A2	address input
15	2Y7	independent input/output
16	2Y6	independent input/output
17	2Z	common input/output
18	2Y5	independent input/output
19	2Y4	independent input/output
20	2Y3	independent input/output
21	2Y2	independent input/output
22	2Y1	independent input/output
23	2Y0	independent input/output
24	V <sub>DD</sub>	supply voltage

## 2.4、Function Table

Input				Selected Channel
$\bar{E}$	A2	A1	A0	
L	L	L	L	1Y0, 2Y0
L	L	L	H	1Y1, 2Y1
L	L	H	L	1Y2, 2Y2
L	L	H	H	1Y3, 2Y3
L	H	L	L	1Y4, 2Y4
L	H	L	H	1Y5, 2Y5
L	H	H	L	1Y6, 2Y6
L	H	H	H	1Y7, 2Y7
H	X	X	X	none

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care.



## 3、Electrical Parameter

### 3.1、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 clamping current	$I_{IK}$	$V_I < 0.5V$ or $V_I > V_{DD} + 0.5V$	-	$\pm 10$	mA
switch current	$I$	-	-	$\pm 10$	mA
input voltage	$V_I$	all inputs	-0.5	$V_{DD} + 0.5$	V
storage temperature	$T_{stg}$	-	-65	+150	$^{\circ}C$
total power dissipation	$P_{tot}$	-	-	500	mW
device dissipation	$P$	per output transistor	-	100	mW
Soldering temperature	$T_L$	10s	250		$^{\circ}C$

Note:

[1] For SOP24 packages: above  $70^{\circ}C$  the value of  $P_{tot}$  derates linearly with 8mW/K.

[2] For (T)SSOP24 packages: above  $60^{\circ}C$  the value of  $P_{tot}$  derates linearly with 5.5mW/K.

### 3.2、Recommended Operating Conditions

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	$V_{DD}$	-	3	5	9	V
ambient temperature	$T_{amb}$	in free air	-40	-	+105	$^{\circ}C$
input voltage	$V_I$	-	0	-	$V_{DD}$	V
multiplexer switch input current capability	-	-	-	-	25	mA
output load resistance	-	-	100	-	-	$\Omega$



### 3.3. Electrical Characteristics

#### 3.3.1. 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
				Min.	Typ.	Max.	
LOW-level input voltage	$V_{IL}$	$ I_O  < 1\mu\text{A}$	$V_{DD}=5\text{V}$ , $V_O=0.5\text{V}$ or $4.5\text{V}$	-	-	1.5	V
			$V_{DD}=9\text{V}$ , $V_O=1.0\text{V}$ or $9\text{V}$	-	-	3	V
HIGH-level input voltage	$V_{IH}$	$ I_O  < 1\mu\text{A}$	$V_{DD}=5\text{V}$ , $V_O=0.5\text{V}$ or $4.5\text{V}$	3.5	-	-	V
			$V_{DD}=9\text{V}$ , $V_O=1.0\text{V}$ or $9\text{V}$	7	-	-	V
input leakage current	$I_I$	$V_I=0\text{V}$ or $9\text{V}$ , $V_{DD}=9\text{V}$		-	$\pm 10^{-5}$	$\pm 0.1$	$\mu\text{A}$
OFF-state leakage current	$I_{S(OFF)}$	$V_{SS}=0\text{V}$ ; $V_{DD}=9\text{V}$		-	$\pm 0.1$	$\pm 100$	nA
supply current	$I_{DD}$	all valid input combinations; $I_O=0\text{A}$	$V_{DD}=5\text{V}$	-	0.04	5	$\mu\text{A}$
			$V_{DD}=9\text{V}$	-	0.04	10	$\mu\text{A}$
input capacitance	$C_I$	any address or inhibit input		-	5	7.5	pF
ON resistance	$R_{ON}$	$V_{SS} \leq V_{is} \leq V_{DD}$	$V_{DD}=5\text{V}$	-	470	1050	$\Omega$
			$V_{DD}=9\text{V}$	-	180	400	$\Omega$
change in on-state resistance between channels	$\Delta R_{ON}$	-	$V_{DD}=5\text{V}$	-	15	-	$\Omega$
			$V_{DD}=9\text{V}$	-	10	-	$\Omega$

#### 3.3.2. DC Characteristics 2

( $T_{amb}=-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$ , voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions (V)		$T_{amb}=-40^{\circ}\text{C}$		$T_{amb}=+85^{\circ}\text{C}$		$T_{amb}=+105^{\circ}\text{C}$		Unit
				Min.	Max.	Min.	Max.	Min.	Max.	
LOW-level input voltage	$V_{IL}$	$ I_O  < 1\mu\text{A}$	$V_{DD}=5\text{V}$ , $V_O=0.5\text{V}$ or $4.5\text{V}$	-	1.5	-	1.5	-	1.5	V
			$V_{DD}=9\text{V}$ , $V_O=1.0\text{V}$ or $9\text{V}$	-	3	-	3	-	3	V
HIGH-level input voltage	$V_{IH}$	$ I_O  < 1\mu\text{A}$	$V_{DD}=5\text{V}$ , $V_O=0.5\text{V}$ or $4.5\text{V}$	3.5	-	3.5	-	3.5	-	V
			$V_{DD}=9\text{V}$ , $V_O=1.0\text{V}$ or $9\text{V}$	7	-	7	-	7	-	V
input leakage current	$I_I$	$V_I=0\text{V}$ or $9\text{V}$ , $V_{DD}=9\text{V}$		-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu\text{A}$
OFF-state leakage current	$I_{S(OFF)}$	$V_{SS}=0\text{V}$ ; $V_{DD}=9\text{V}$		-	$\pm 100$	-	$\pm 1000$	-	$\pm 1000$	nA
supply current	$I_{DD}$	all valid input combinations; $I_O=0\text{A}$	$V_{DD}=5\text{V}$	-	5	-	150	-	150	$\mu\text{A}$
			$V_{DD}=9\text{V}$	-	10	-	300	-	300	$\mu\text{A}$
ON resistance	$R_{ON}$	$V_{SS} \leq V_{is} \leq V_{DD}$	$V_{DD}=5\text{V}$	-	850	-	1200	-	1300	$\Omega$
			$V_{DD}=9\text{V}$	-	330	-	520	-	550	$\Omega$



### 3.3.3、AC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH to LOW propagation delay time	$t_{PHL}$	nYn, nZ to nZ, nYn; see Figure 3	$V_{DD}=5V$	-	30	60	ns
			$V_{DD}=9V$	-	15	30	ns
LOW to HIGH propagation delay	$t_{PLH}$	nYn, nZ to nZ, nYn; see Figure 3	$V_{DD}=5V$	-	30	60	ns
			$V_{DD}=9V$	-	15	30	ns
HIGH to OFF-state propagation delay	$t_{PHZ}$	$\bar{E}$ to nYn, nZ; see Figure 4	$V_{DD}=5V$	-	325	650	ns
			$V_{DD}=9V$	-	135	270	ns
LOW to OFF-state propagation delay	$t_{PLZ}$	$\bar{E}$ to nYn, nZ; see Figure 4	$V_{DD}=5V$	-	325	650	ns
			$V_{DD}=9V$	-	135	270	ns
OFF-state to HIGH propagation delay	$t_{PZH}$	$\bar{E}$ to nYn, nZ; see Figure 4	$V_{DD}=5V$	-	220	440	ns
			$V_{DD}=9V$	-	90	180	ns
OFF-state to LOW propagation delay	$t_{PZL}$	$\bar{E}$ to nYn, nZ; see Figure 4	$V_{DD}=5V$	-	220	440	ns
			$V_{DD}=9V$	-	90	180	ns

### 3.3.4、AC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
-3dB frequency response	$f_{(-3dB)}$	$V_{is}=5V; V_{DD}=9V;$ $R_L=1k\Omega;$ see Figure 6	$V_{os}$ at Z	-	20	-	MHz
			$V_{os}$ at any channel	-	60	-	MHz
total harmonic distortion	THD	$f_{is}=1kHz$ sine wave; see Figure 5	$V_{is}=2V; V_{DD}=5V;$ $R_L=10k\Omega$	-	0.3	-	%
			$V_{is}=3V; V_{DD}=9V;$ $R_L=10k\Omega$	-	0.2	-	%
-40dB feed through frequency	$f_{(-40dB)}$	$V_{is}=5V; V_{DD}=9V;$ $R_L=1k\Omega;$ all channel off	$V_{os}$ at Z	-	12	-	MHz
			$V_{os}$ at any channel	-	8	-	MHz
crosstalk	Xtalk	$V_{is}=5V; V_{DD}=9V;$ $R_L=1k\Omega;$ frequency at-40dB; see Figure 8	measured on common	-	10	-	MHz
			measured on any channel	-	18	-	MHz
crosstalk voltage	$V_{ct}$	$V_{DD}=9V; R_L=10k\Omega; V_C=V_{DD}-V_{SS}$ (square wave); see Figure 7	-	75	-	mV	

Note:

[1]  $20\log(V_{os}/V_{is}) = -3dB$ .

[2]  $20\log(V_{os}/V_{is}) = -40dB$ .

[3] Peak-to-peak voltage symmetrical about  $(V_{DD}-V_{SS})/2$





### 4、 Testing Circuit

#### 4.1、 AC Testing Circuit 1

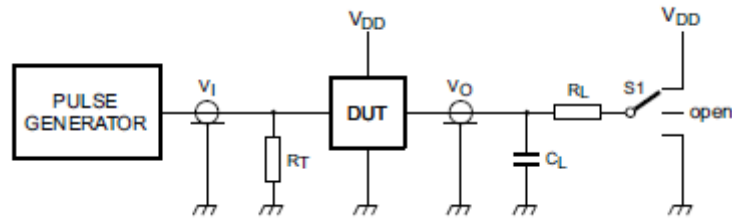


Figure 2. Test circuit for switching times

Definitions for test circuit:

$C_L$ =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.

$S1$ =Test selection switch.

#### 4.2、 AC Testing Waveforms

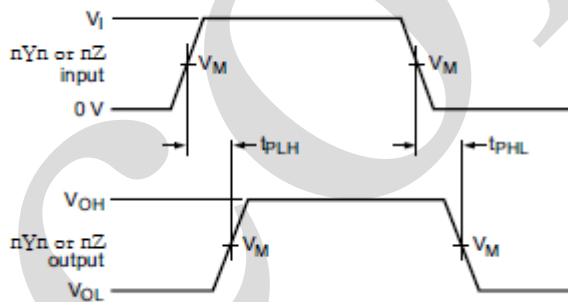


Figure 3. nYn, nZ to nZ, nYn propagation delays

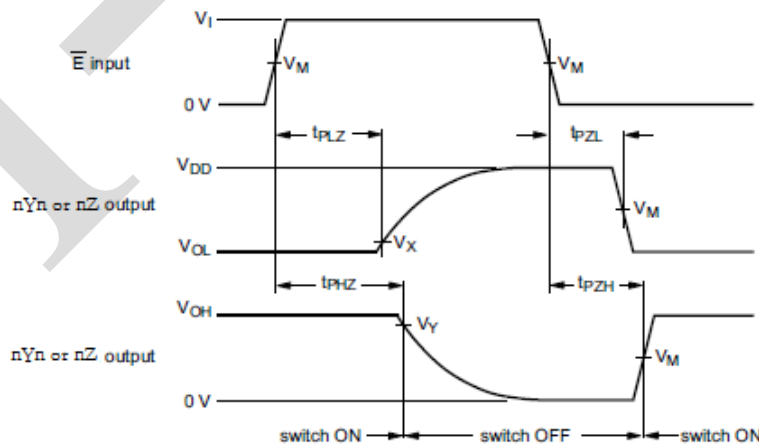


Figure 4. Enable and disable times



4.3、AC Testing Circuit 2

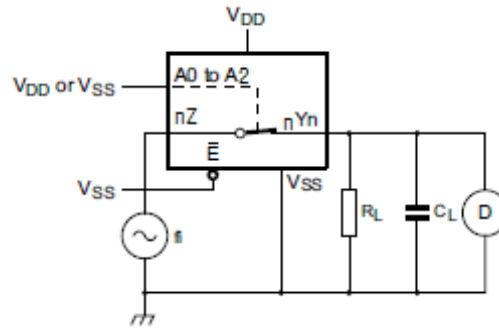


Figure 5. Test circuit for measuring total harmonic distortion

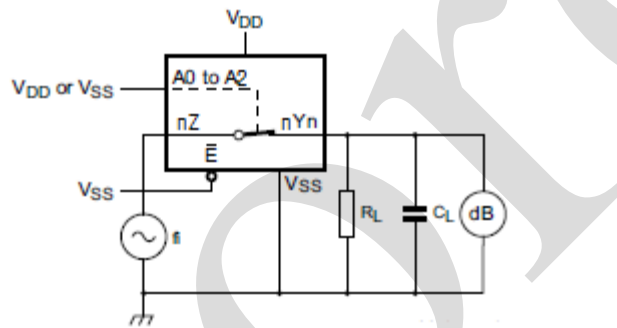
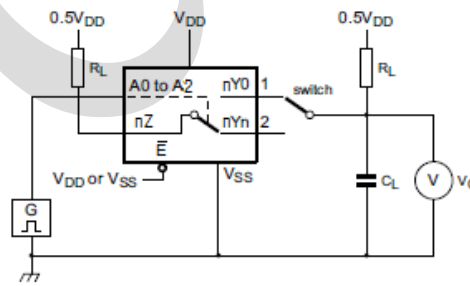
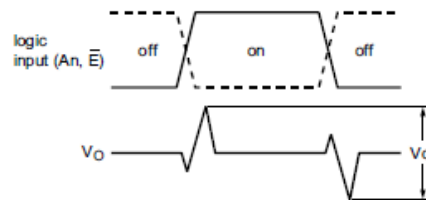


Figure 6. Test circuit for measuring frequency response

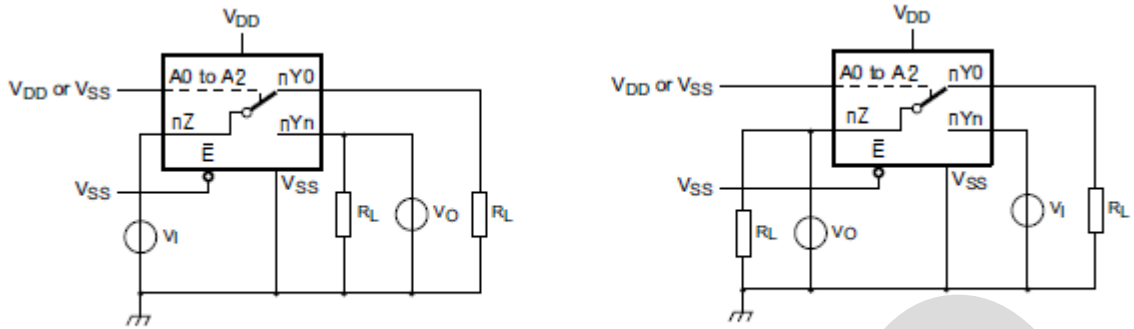


a. Test circuit



b. Input and output pulse definitions

Figure 7. Test circuit for measuring crosstalk voltage between digital inputs and switch



a. Switch closed condition

b. Switch open condition

Figure 8. Test circuit for measuring crosstalk between switches

#### 4.4、 Measurement Points

Supply voltage	Input	Output
$V_{DD}$	$V_M$	$V_M$
3V to 9V	$0.5 \times V_{DD}$	$0.5 \times V_{DD}$

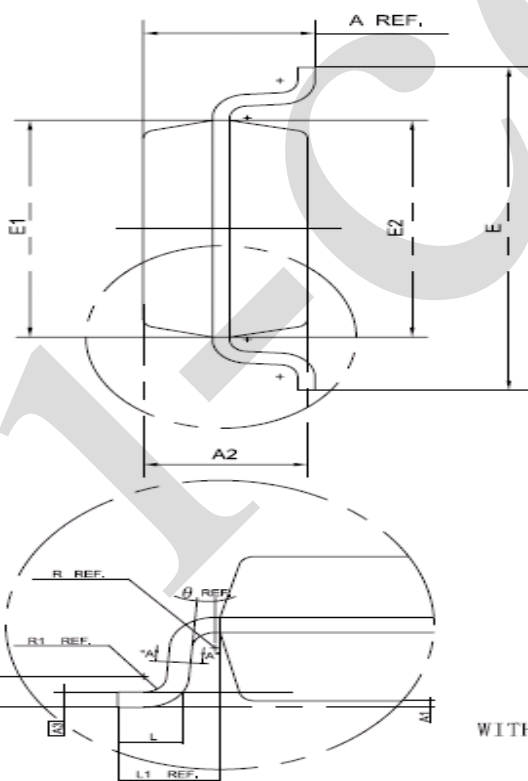
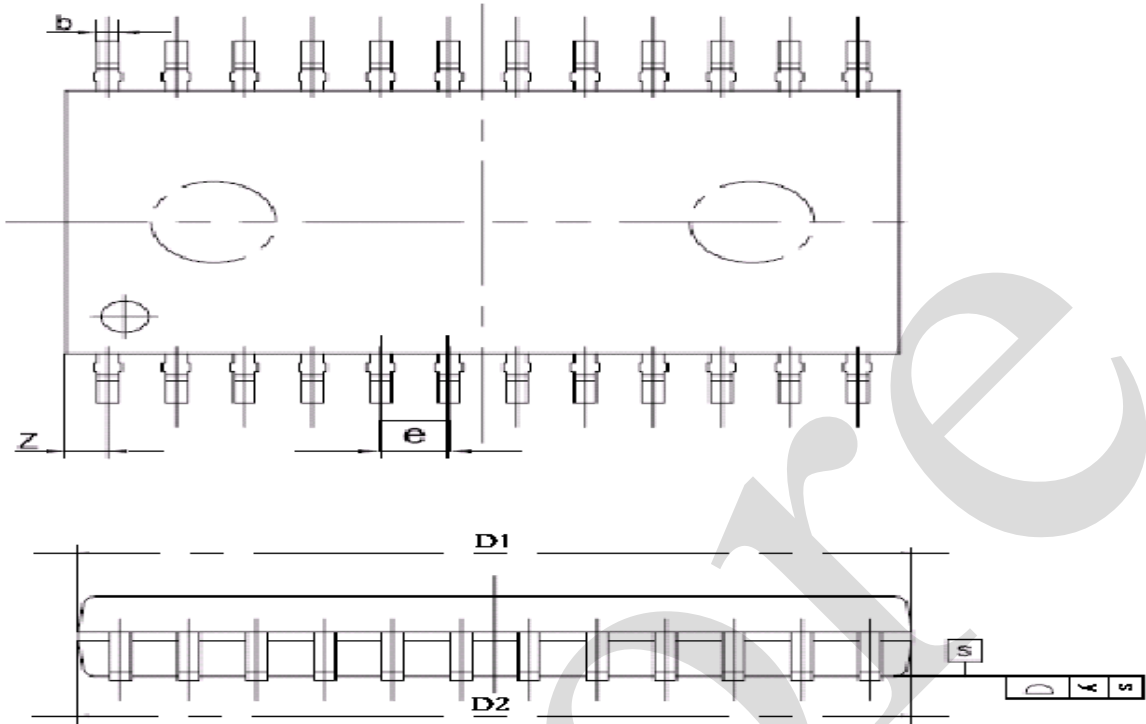
#### 4.5、 Test Data

Test	Input		Load		S1 position
	$V_M$	$t_r, t_f$	$C_L$	$R_L$	
$t_{PHL}$	$0.5 \times V_{DD}$	$\leq 20\text{ns}$	50pF	10k $\Omega$	$V_{DD}$ or $V_{SS}$
$t_{PLH}$	$0.5 \times V_{DD}$	$\leq 20\text{ns}$	50pF	10k $\Omega$	$V_{SS}$
$t_{PZH}, t_{PHZ}$	$0.5 \times V_{DD}$	$\leq 20\text{ns}$	50pF	10k $\Omega$	$V_{SS}$
$t_{PZL}, t_{PLZ}$	$0.5 \times V_{DD}$	$\leq 20\text{ns}$	50pF	10k $\Omega$	$V_{DD}$
other	$0.5 \times V_{DD}$	$\leq 20\text{ns}$	50pF	10k $\Omega$	$V_{SS}$

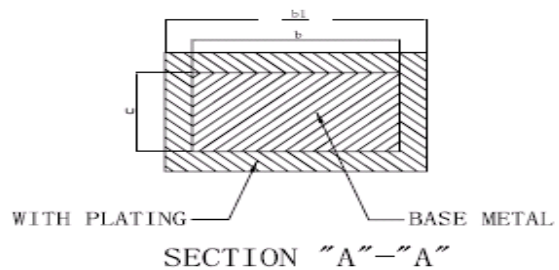


## 5、Package Information

### 5.1、SOP24

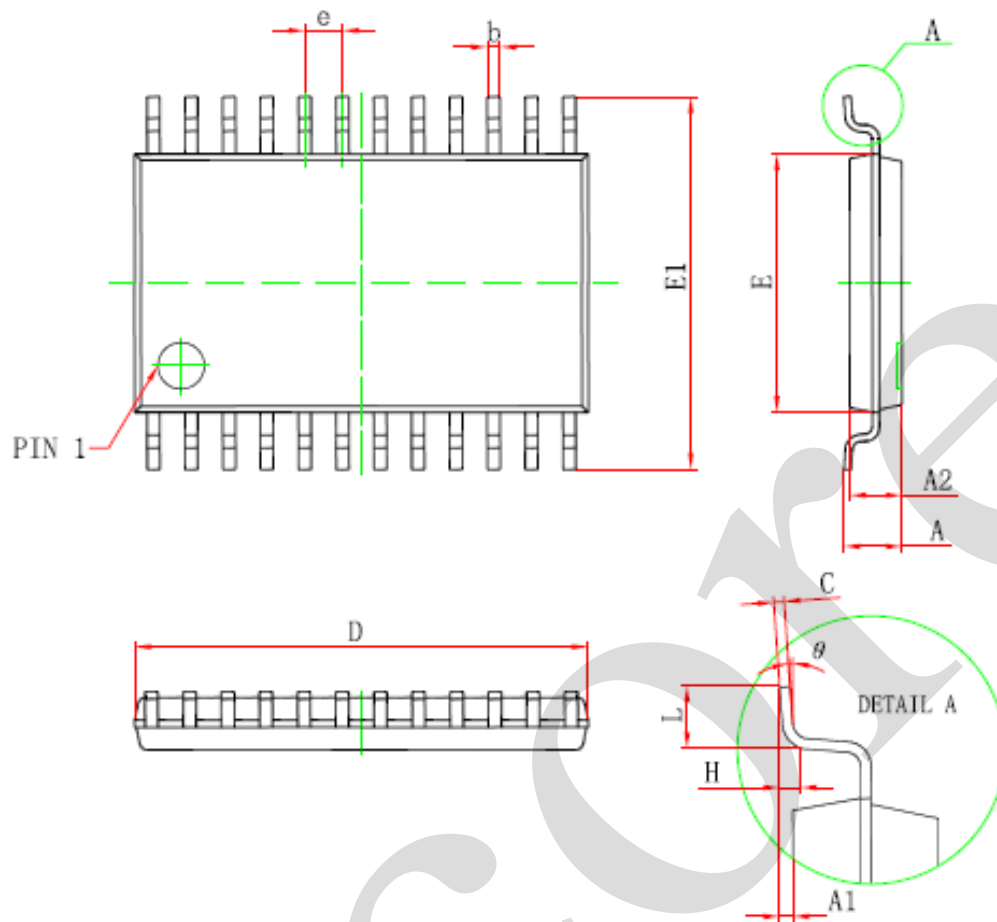


Symbol	Min	Nom	Max
A	2.465	2.515	2.565
A1	0.100	0.150	0.200
A2	2.100	2.300	2.500
A3	—	0.274	—
b	0.356	0.406	0.456
b1	0.366	0.426	0.486
c	—	0.254	—
D1	—	15.240	—
D2	—	15.290	—
E	10.250	10.300	10.350
E1	7.404	7.450	7.454
E2	7.400	7.500	7.600
e	—	1.27	—
L	0.764	0.864	0.964
L1	1.303	1.403	1.503
R	—	0.200	—
R1	—	0.300	—
θ	0	—	—
θ 1	0	—	10°
y	—	—	0.1
Z	—	0.660	—





## 5.3、TSSOP24



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	7.700	7.900	0.303	0.311
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
e	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A		1.200		0.047
A2	0.800	1.000	0.031	0.039
A1	0.050	0.150	0.002	0.006
e	0.65 (BSC)		0.026 (BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
$\theta$	1°	7°	1°	7°



## 6、 Statements And Notes

### 6.1、 The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

### 6.2、 Notion

Recommended carefully reading this information before the use of this product;

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