

Hex Inverting Schmitt Trigger

**CJ74LV14**

Logic

**1 Introduction**

The CJ74LV14 is a low-voltage Si-gate CMOS device that is pin and function compatible with CJ74HC14 and CJ74HCT14.

The CJ74LV14 provides six inverting buffers with Schmitt-trigger input. It is capable of transforming slowly-changing input signals into sharply defined, jitter-free output signals.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage  $V_{T+}$  and the negative voltage  $V_{T-}$  is defined as the input hysteresis voltage  $V_H$ .

**3 Features**

- Operating voltage: 1.0V to 5.5V
- 5.5V tolerant inputs/outputs
- Power-down mode
- Specified from -40°C to +125°C

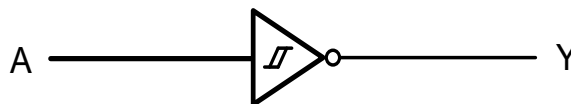
**4 Applications**

- Network switches
- Wearable health and fitness devices
- PDAs
- LCD TVs
- Power infrastructure

**2 Available Packages**

PART NUMBER	PACKAGE
CJ74LV14	SOP14
	TSSOP14

**Note:** For all available packages, please refer to the part Orderable Information.



Simplified schematic

**5 Orderable Information**

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74LV14ADN	SOP14	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units / Reel	Active
CJ74LV14BDN	TSSOP14	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 5000 Units / Reel	Active

**Note:**

**ECO PLAN:** For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

**MSL:** Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

**SORT:** Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

## 6 Pin Configuration and Marking Information

### 6.1 Pin Configuration

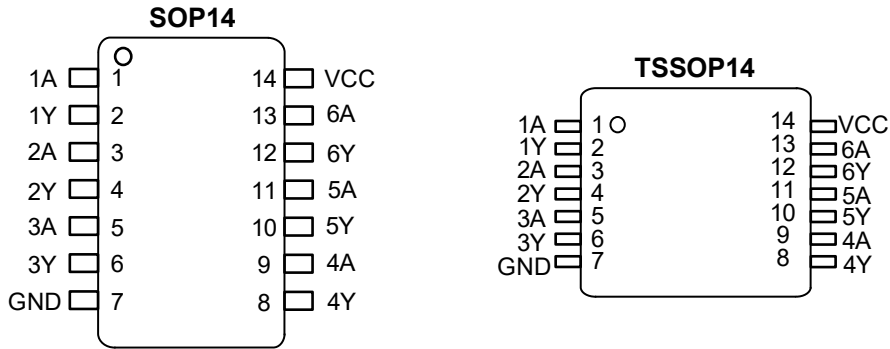


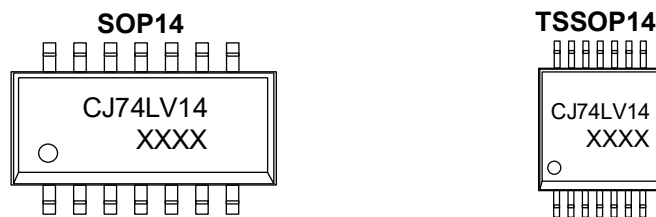
Figure 6-1 Pin configuration

### 6.2 Pin Function

PIN		I/O <sup>(1)</sup>	DESCRIPTION
No.	NAME		
1	1A	I	Data input
2	1Y	O	Data output
3	2A	I	Data input
4	2Y	O	Data output
5	3A	I	Data input
6	3Y	O	Data output
7	GND	G	Ground (0V)
8	4Y	O	Data output
9	4A	I	Data input
10	5Y	O	Data output
11	5A	I	Data input
12	6Y	O	Data output
13	6A	I	Data input
14	VCC	P	Supply voltage

(1) I-Input, O-Output, P-Power, G-Ground

### 6.3 Marking Information



XXXX: Code, indicates weekly record information.

## 7 Specifications

### 7.1 Absolute Maximum Ratings

Voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	MAX.	UNIT
$V_{CC}$	Supply voltage	-		-0.5	+7.0	V
$I_{IK}$	Input clamping current	$V_I < -0.5V$ or $V_I > V_{CC}+0.5V$		-	$\pm 20$	mA
$I_{OK}$	Output clamping current	$V_O < -0.5V$ or $V_O > V_{CC}+0.5V$		-	$\pm 50$	mA
$I_O$	Output current	$V_O = -0.5V$ to $(V_{CC}+0.5V)$		-	$\pm 25$	mA
$I_{CC}$	Supply current	-		-	50	mA
$I_{GND}$	Ground current	-		-50	-	mA
$T_{stg}$	Storage temperature	-		-65	+150	°C
$P_{tot}$	Total power dissipation	-		-	500	mW
$T_L$	Soldering temperature	10s	SOP/TSSOP	-	260	°C

**Note:** Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

### 7.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CC}$	Supply voltage	-	1.0	3.3	5.5	V
$V_I$	Input voltage	-	0	-	$V_{CC}$	V
$V_O$	Output voltage	-	0	-	$V_{CC}$	V
$T_{amb}$	Ambient temperature	-	-40	-	+125	°C

**Note:** The static characteristics are guaranteed from  $V_{CC}=1.2V$  to  $V_{CC}=5.5V$ , but LV devices are guaranteed to function down to  $V_{CC}=1.0V$  (with input levels GND or  $V_{CC}$ ).

### 7.3 ESD Ratings

SYMBOL	ESD RATINGS		VALUE	UNIT
$V_{ESD-HBM}$	Electrostatic discharge	Human body model (HBM) <sup>(1)</sup>	$\pm 2000$	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

**7.4 Electrical Characteristics**
**7.4.1 DC Characteristics 1**
 $T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
$V_{OH}$	HIGH-level output voltage	$V_I = V_{T+}$ or $V_{T-}$	$I_O = -100\mu\text{A}; V_{CC} = 1.2\text{V}$	-	1.2	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 2.0\text{V}$	1.8	2.0	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 2.7\text{V}$	2.5	2.7	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 3.0\text{V}$	2.8	3.0	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 4.5\text{V}$	4.3	4.5	-	V
			$I_O = -6\text{mA}; V_{CC} = 3.0\text{V}$	2.4	2.82	-	V
			$I_O = -12\text{mA}; V_{CC} = 4.5\text{V}$	3.6	4.2	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{T+}$ or $V_{T-}$	$I_O = 100\mu\text{A}; V_{CC} = 1.2\text{V}$	-	0	-	V
			$I_O = 100\mu\text{A}; V_{CC} = 2.0\text{V}$	-	0	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 2.7\text{V}$	-	0	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 3.0\text{V}$	-	0	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 4.5\text{V}$	-	0	0.2	V
			$I_O = 6\text{mA}; V_{CC} = 3.0\text{V}$	-	0.25	0.40	V
			$I_O = 12\text{mA}; V_{CC} = 4.5\text{V}$	-	0.35	0.55	V
$I_I$	Input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$	-	-	1.0	$\mu\text{A}$	
$I_{CC}$	Supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 5.5\text{V}$	-	-	20	$\mu\text{A}$	
$\Delta I_{CC}$	Additional supply current	Per input; $V_I = V_{CC} - 0.6\text{V}; V_{CC} = 2.7\text{V}$ to $3.6\text{V}$	-	-	500	$\mu\text{A}$	
$C_i$	Input capacitance	-	-	3.5	-	pF	

**Note:** Typical values are measured at  $T_{amb} = 25^{\circ}\text{C}$ .

**7.4.2 DC Characteristics 2**
 $T_{amb} = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
$V_{OH}$	HIGH-level output voltage	$V_I = V_{T+}$ or $V_{T-}$	$I_O = -100\mu\text{A}; V_{CC} = 2.0\text{V}$	1.8	-	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 2.7\text{V}$	2.5	-	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 3.0\text{V}$	2.8	-	-	V
			$I_O = -100\mu\text{A}; V_{CC} = 4.5\text{V}$	4.3	-	-	V
			$I_O = -6\text{mA}; V_{CC} = 3.0\text{V}$	2.2	-	-	V
			$I_O = -12\text{mA}; V_{CC} = 4.5\text{V}$	3.5	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{T+}$ or $V_{T-}$	$I_O = 100\mu\text{A}; V_{CC} = 2.0\text{V}$	-	-	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 2.7\text{V}$	-	-	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 3.0\text{V}$	-	-	0.2	V
			$I_O = 100\mu\text{A}; V_{CC} = 4.5\text{V}$	-	-	0.2	V
			$I_O = 6\text{mA}; V_{CC} = 3.0\text{V}$	-	-	0.50	V
			$I_O = 12\text{mA}; V_{CC} = 4.5\text{V}$	-	-	0.65	V
$I_I$	Input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{V}$	-	-	1.0	$\mu\text{A}$	
$I_{CC}$	Supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC} = 5.5\text{V}$	-	-	40	$\mu\text{A}$	
$\Delta I_{CC}$	Additional supply current	Per input; $V_I = V_{CC} - 0.6\text{V}; V_{CC} = 2.7\text{V}$ to $3.6\text{V}$	-	-	850	$\mu\text{A}$	

**Note:** Typical values are measured at  $T_{amb} = 25^{\circ}\text{C}$ .

**7.4.3 AC Characteristics 1**

T<sub>amb</sub>=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
t <sub>pd</sub>	nA to nY propagation delay	See Figure 8-5	V <sub>CC</sub> =1.2V	-	80	-	ns
			V <sub>CC</sub> =2.0V	-	27	37	ns
			V <sub>CC</sub> =2.7V	-	20	28	ns
			V <sub>CC</sub> =3.0V to 3.6V; C <sub>L</sub> =15pF	-	13	-	ns
			V <sub>CC</sub> =3.0V to 3.6V	-	15	22	ns
			V <sub>CC</sub> =4.5V to 5.5V	-	-	18	ns
C <sub>PD</sub>	Power dissipation capacitance	C <sub>L</sub> =50pF; f <sub>i</sub> =1MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	-	15	-	pF	

**Note:**

- (1) Typical values are measured at T<sub>amb</sub>=25°C.
- (2) t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- (3) Typical values are measured at nominal supply voltage (V<sub>CC</sub>=3.3V).
- (4) C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in uW).  
 $P_D = (C_{PD} \times V_{CC}^2 \times f_i \times N) + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub>=input frequency in MHz;  
 f<sub>o</sub>=output frequency in MHz;  
 C<sub>L</sub>=output load capacitance in pF;  
 N=number of inputs switching;  
 V<sub>CC</sub>=supply voltage in V.

**7.4.4 AC Characteristics 2**

T<sub>amb</sub>=-40°C to +125°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
t <sub>pd</sub>	nA to nY propagation delay	See Figure 8-5	V <sub>CC</sub> =2.0V	-	-	48	ns
			V <sub>CC</sub> =2.7V	-	-	35	ns
			V <sub>CC</sub> =3.0V to 3.6V	-	-	28	ns
			V <sub>CC</sub> =4.5V to 5.5V	-	-	23	ns

**Note:**

- (1) Typical values are measured at T<sub>amb</sub>=25°C.
- (2) t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- (3) Typical values are measured at nominal supply voltage (V<sub>CC</sub>=3.3V).

**7.4.5 Transfer Characteristics 1**
 $T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
$V_{T+}$	Positive-going threshold voltage	See Figure 8-6 and Figure 8-7	$V_{CC}=1.2\text{V}$	-	0.70	-	V
			$V_{CC}=2.0\text{V}$	0.8	1.10	1.4	V
			$V_{CC}=2.7\text{V}$	1.0	1.45	2.0	V
			$V_{CC}=3.0\text{V}$	1.2	1.60	2.2	V
			$V_{CC}=3.6\text{V}$	1.5	1.95	2.4	V
			$V_{CC}=4.5\text{V}$	1.7	2.50	3.15	V
			$V_{CC}=5.5\text{V}$	2.1	3.00	3.85	V
$V_{T-}$	Negative-going threshold voltage	See Figure 8-6 and Figure 8-7	$V_{CC}=1.2\text{V}$	-	0.34	-	V
			$V_{CC}=2.0\text{V}$	0.3	0.65	0.9	V
			$V_{CC}=2.7\text{V}$	0.4	0.90	1.4	V
			$V_{CC}=3.0\text{V}$	0.6	1.05	1.5	V
			$V_{CC}=3.6\text{V}$	0.8	1.30	1.8	V
			$V_{CC}=4.5\text{V}$	0.9	1.60	2.0	V
			$V_{CC}=5.5\text{V}$	1.1	2.00	2.6	V
$V_H$	Hysteresis voltage	See Figure 8-6 and Figure 8-7	$V_{CC}=1.2\text{V}$	-	0.3	-	V
			$V_{CC}=2.0\text{V}$	0.2	0.55	0.8	V
			$V_{CC}=2.7\text{V}$	0.3	0.60	1.1	V
			$V_{CC}=3.0\text{V}$	0.4	0.65	1.2	V
			$V_{CC}=3.6\text{V}$	0.4	0.70	1.2	V
			$V_{CC}=4.5\text{V}$	0.4	0.80	1.4	V
			$V_{CC}=5.5\text{V}$	0.6	1.00	1.5	V

**Note:** All typical values are measured at  $T_{amb}=25^{\circ}\text{C}$ .

7.4.6 Transfer Characteristics 2

T<sub>amb</sub>=-40°C to +125°C, voltages are referenced to GND (ground = 0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
V <sub>T+</sub>	Positive-going threshold voltage	See Figure 8-6 and Figure 8-7	V <sub>CC</sub> =2.0V	0.8	-	1.4	V
			V <sub>CC</sub> =2.7V	1.0	-	2.0	V
			V <sub>CC</sub> =3.0V	1.2	-	2.2	V
			V <sub>CC</sub> =3.6V	1.5	-	2.4	V
			V <sub>CC</sub> =4.5V	1.7	-	3.15	V
			V <sub>CC</sub> =5.5V	2.1	-	3.85	V
V <sub>T-</sub>	Negative-going threshold voltage	See Figure 8-6 and Figure 8-7	V <sub>CC</sub> =2.0V	0.3	-	0.9	V
			V <sub>CC</sub> =2.7V	0.4	-	1.4	V
			V <sub>CC</sub> =3.0V	0.6	-	1.5	V
			V <sub>CC</sub> =3.6V	0.8	-	1.8	V
			V <sub>CC</sub> =4.5V	0.9	-	2.0	V
			V <sub>CC</sub> =5.5V	1.1	-	2.6	V
V <sub>H</sub>	Hysteresis voltage	See Figure 8-6 and Figure 8-7	V <sub>CC</sub> =2.0V	0.2	-	0.8	V
			V <sub>CC</sub> =2.7V	0.3	-	1.1	V
			V <sub>CC</sub> =3.0V	0.4	-	1.2	V
			V <sub>CC</sub> =3.6V	0.4	-	1.2	V
			V <sub>CC</sub> =4.5V	0.4	-	1.4	V
			V <sub>CC</sub> =5.5V	0.6	-	1.5	V

**Note:** All typical values are measured at T<sub>amb</sub>=25°C.

## 8 Detailed Description

### 8.1 Overview

The CJ74LV14 is a low-voltage Si-gate CMOS device that is pin and function compatible with CJ74HC14 and CJ74HCT14.

The CJ74LV14 provides six inverting buffers with Schmitt-trigger input. It is capable of transforming slowly-changing input signals into sharply defined, jitter-free output signals.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage  $V_{T+}$  and the negative voltage  $V_{T-}$  is defined as the input hysteresis voltage  $V_H$ .

### 8.2 Functional Block Diagram

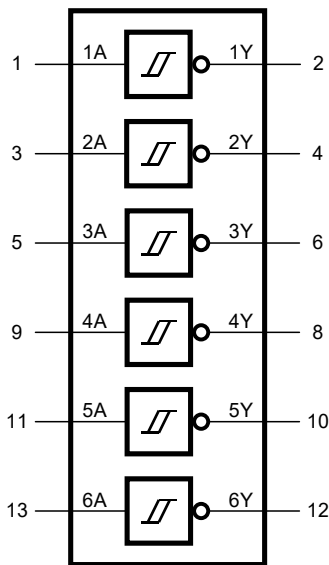


Figure 8-1 Logic symbol

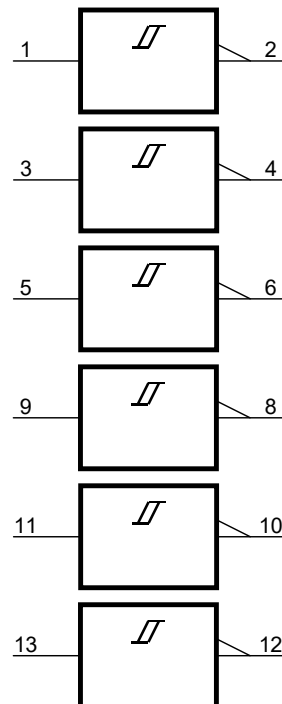


Figure 8-2 IEC Logic symbol

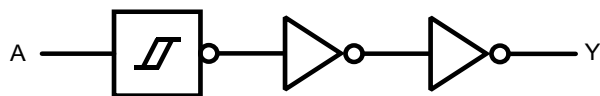


Figure 8-3 Logic diagram for one schmitt trigger

### 8.3 Function Table<sup>(1)</sup>

INPUT	OUTPUT
nA	nY
L	H
H	L

(1) H=HIGH voltage level; L=LOW voltage level.

8.4 Testing Circuit

8.4.1 AC Testing Circuit

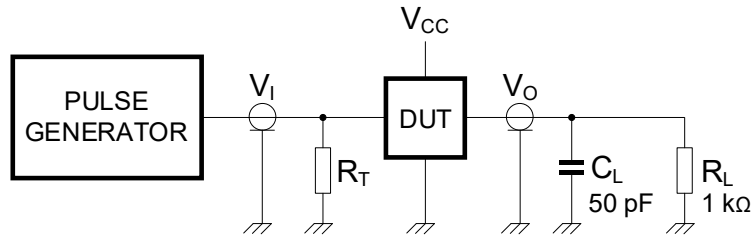


Figure 8-4 Test circuit for measuring switching times

Definitions for test circuit:

$C_L$ =Load capacitance including jig and probe capacitance.

$R_L$ =Load resistance.

$R_T$ =Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.

8.4.2 AC Testing Waveforms

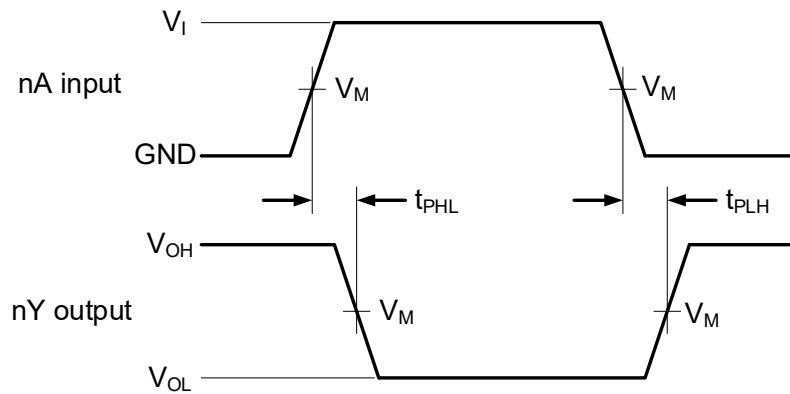


Figure 8-5 The input (nA) to output (nY) propagation delays

8.4.3 Transfer Characteristics Waveforms

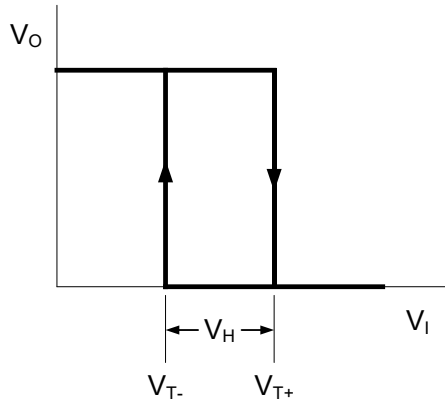
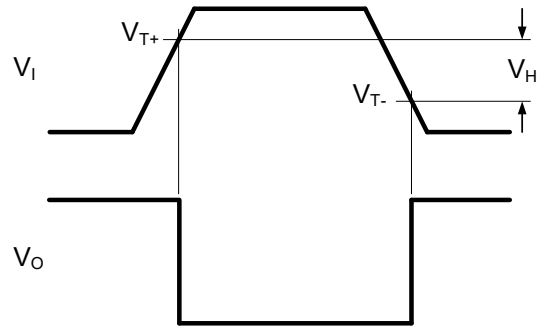
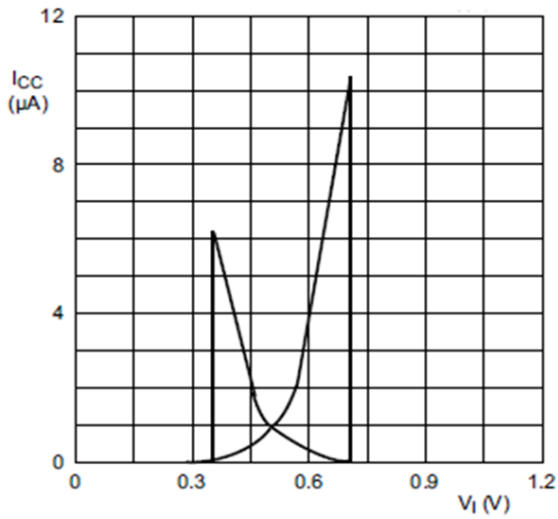


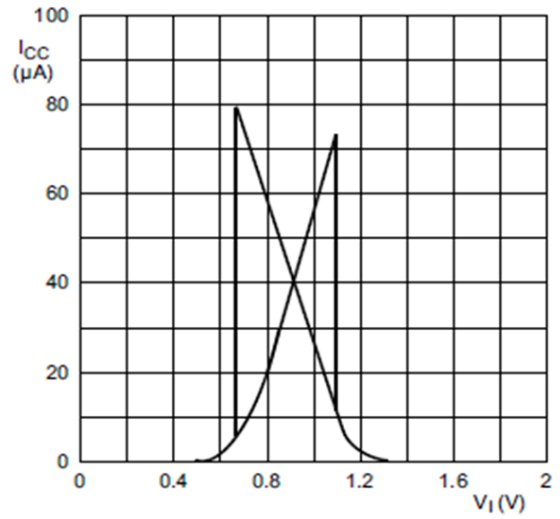
Figure 8-6 Transfer characteristic



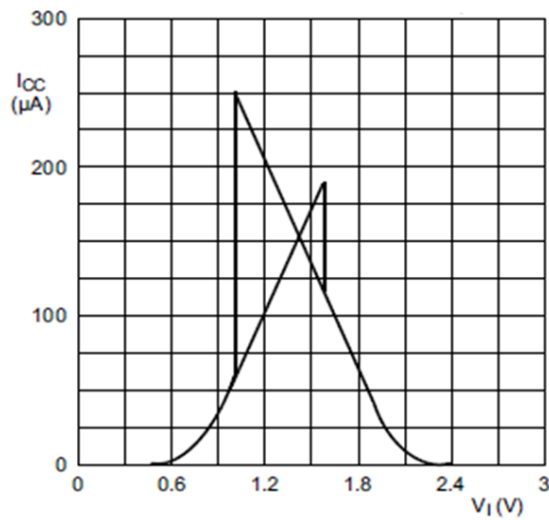
$V_{T+}$  and  $V_{T-}$  limits at 70% and 20%  
Figure 8-7 Definition of  $V_{T+}$ ,  $V_{T-}$  and  $V_H$



$V_{CC} = 1.2 V$



$V_{CC} = 2.0 V$



$V_{CC} = 3.0 V$

Figure 8-8 Typical transfer characteristics

**8.4.4 Measurement Points**

SUPPLY VOLTAGE	INPUT	OUTPUT
$V_{CC}$	$V_M$	$V_M$
< 2.7V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7V to 3.6V	1.5V	1.5V
$\geq 4.5V$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

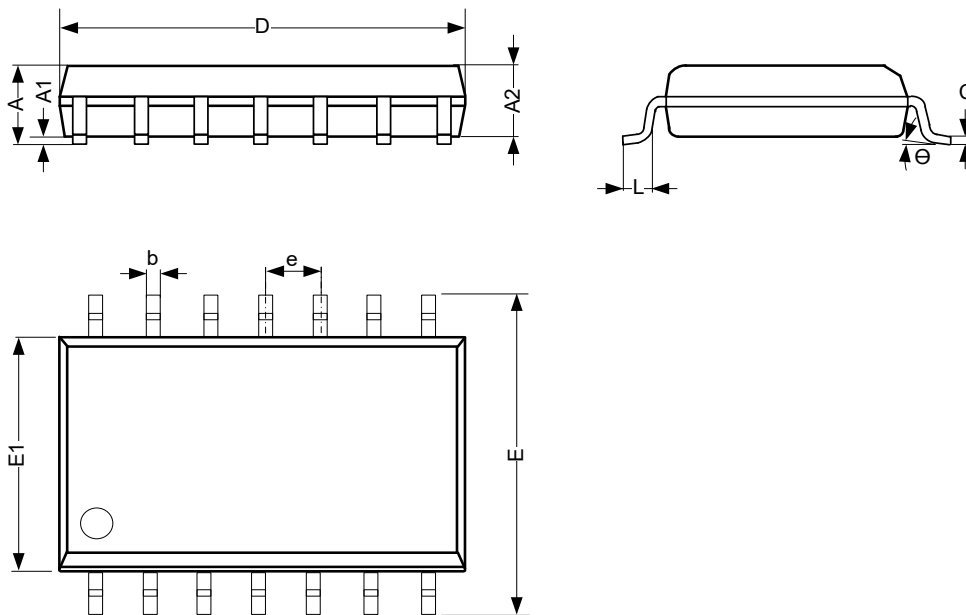
**8.4.5 Test Data**

SUPPLY VOLTAGE	INPUT	
$V_{CC}$	$V_I$	$t_r, t_f$
< 2.7V	$V_{CC}$	$\leq 2.5ns$
2.7V to 3.6V	2.7V	$\leq 2.5ns$
$\geq 4.5V$	$V_{CC}$	$\leq 2.5ns$

9 Mechanical Information

9.1 SOP14 Mechanical Information

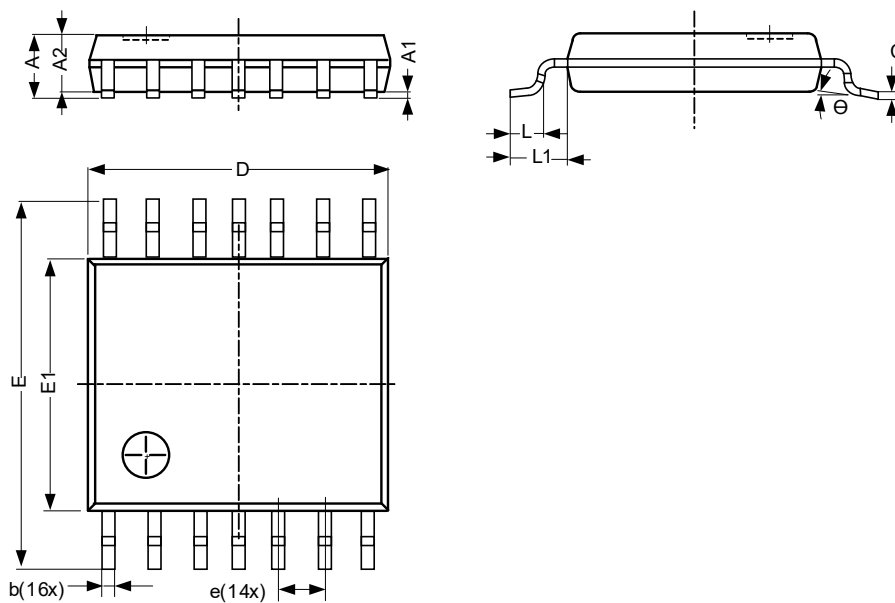
9.1.1 SOP14 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	1.50	-	1.75
A1	0.05	-	0.25
A2	1.30	-	-
b	0.33	-	0.50
c	0.19	-	0.25
D	8.43	-	8.76
E	5.80	-	6.25
E1	3.75	-	4.00
e	1.27 BSC		
L	0.40	-	0.89
θ	0°	-	8°
Unit: mm			

9.2 TSSOP14 Mechanical Information

9.2.1 TSSOP14 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	-	-	1.20
A1	0.05	-	0.15
A2	0.80	-	1.05
b	0.19	-	0.30
c	0.09	-	0.20
D	4.90	-	5.10
E	6.20	-	6.60
E1	4.30	-	4.50
e	0.65 BSC		
L	0.45	-	0.75
L1	-	1.00	-
θ	0°	-	8°
Unit: mm			

## 10 Notes and Revision History

### 10.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- <https://www.jscj-elec.com> for more details.

### 10.2 Notes

#### Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

# DISCLAIMER

## IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of JSCJ, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. JSCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

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