

## 1、General Description

LM293/LM393 consists of two independent comparators. The circuit can work under a single power supply with a wide voltage range, and now it also supports dual power supply. When dual power supplies are used, the voltage difference between the two power supplies is between 2V and 18V, and  $V_{CC}$  is at least 1.5V higher than the input common-mode voltage. The quiescent current power consumption is independent of the supply voltage. The output can be connected to the open collector output terminals of other devices to achieve the wired-and relationship. It can be mainly used in industry, automobile, power supply monitoring, oscillator peak detector, logic voltage conversion and other systems.

### Features:

- Operating voltage range:  
Single power supply 2V~18V  
Dual power supply  $\pm 1V \sim \pm 9V$
- Low supply current is independent of supply voltage: 0.5mA (typical)
- Low input offset current: 5nA (typical)  
Low input bias current: 25nA (typical)
- Low input offset voltage: 2mV (typical)
- The common-mode input voltage range includes ground.
- Differential input voltage range is equal to the maximum rated power supply voltage:  $\pm 18V$ .  
Low output saturation voltage
- The output is compatible with TTL, MOS and CMOS.
- Packaging form: SOP8/DIP8/MSOP8

### Ordering Information:

#### Tube packing specifications:

Part number	Packaging form	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
LM293P	DIP8	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Size of plastic package: 9.2mm×6.4mm Pin spacing: 2.54mm
LM393P	DIP8	50 PCS/ tube	40 Tube/box	2000 PCS/ box	Size of plastic package: 9.2mm×6.4mm Pin spacing: 2.54mm

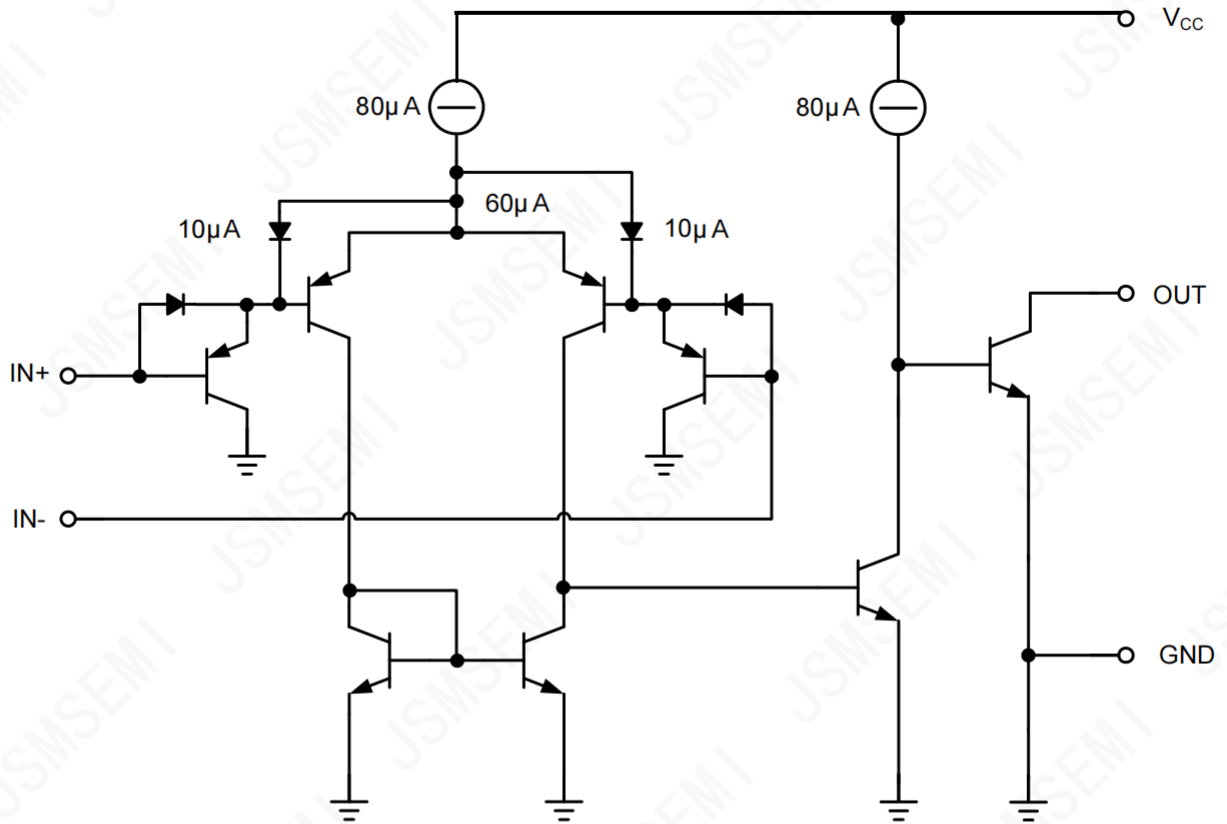
#### Reel packing specifications:

Part number	Packaging form	Reel quantity	Boxed reel quantity	Notes
LM293DR	SOP8	2500PCS/ disc	5000PCS/ box	Size of plastic package: 4.9mm×3.9mm P in spacing: 1.27mm
LM393DR	SOP8	2500PCS/ disc	5000PCS/ box	Plastic package size: 4.9mm×3.9mm Pin spacing: 1.27mm
LM393M	MSOP8	5000PCS/ disc	10000PCS/ box	Size of plastic package: 3.0mm×3.0mm P in spacing: 0.65mm

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



### 2.2、Pin Configurations



### 2.3、Pin Description

Pin No.	Pin Name	Description
1	1OUT	Output of comparator 1
2	1IN-	Negative input of comparator 1
3	1IN+	Positive input of comparator 1
4	GND	GND
5	2IN+	Positive input of comparator 2
6	2IN-	Negative input of comparator 2
7	2OUT	Output of comparator 2
8	V <sub>CC</sub>	Power Supply

### 3、Electrical Parameter

#### 3.1、Absolute Maximum Ratings

( $T_{amb}=25^{\circ}\text{C}$ , unless otherwise specified)

Parameter	Symbol	Conditions	value	Unit	
Power supply voltage	$V_{CC}$	—	20	V	
Differential input voltage	$V_{ID}$	—	$\pm 20$	V	
Input voltage range	$V_I$	—	-0.3~20	V	
incoming current	$I_{IK}$	—	-50	mA	
Output voltage	$V_O$	—	20	V	
thermal resistance	DIP8	$R_{\theta JA}$	—	110	$^{\circ}\text{C}/\text{W}$
	SOP8		—	160	
	MSOP8		—	210	
output current	$I_O$	—	20	mA	
operating junction temperature range	$T_J$	—	150	$^{\circ}\text{C}$	
storage temperature	$T_{stg}$	—	-65~150	$^{\circ}\text{C}$	
Lead temperature	$T_L$	10 s	DIP	250	$^{\circ}\text{C}$
			SOP/MSOP	260	

Maximum power dissipation is a function of  $T_{J(max)}$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_{J(max)} - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of  $150^{\circ}\text{C}$  can affect reliability.

#### 3.2、Recommended operating conditions

( $T_{amb}=25^{\circ}\text{C}$ ,  $V_{DD}=2.5\text{V}$ ,  $f_{osc}=3.579545\text{MHz}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	$V_{CC}$	—	2	—	18	V
junction temperature	$T_J$	—	—	—	85	$^{\circ}\text{C}$
ambient temperature	$T_{amb}$	LM293	-40	—	85	$^{\circ}\text{C}$
		LM393	-40	—	85	$^{\circ}\text{C}$

#### 3.3、DC Characteristics

(unless otherwise specified,  $V_{CC}=5\text{V}$ )

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Parameter	
Input offset voltage	$V_{IO}$	$V_{CC}=5\text{V}\sim 36\text{V}$ , $V_{IC}=V_{ICRmin}$ , $V_O=1.4\text{V}$	$25^{\circ}\text{C}$	—	2	5	mV	
			Total temperature	—	—	9		
Input offset current	$I_{IO}$	$V_O=1.4\text{V}$	—	$25^{\circ}\text{C}$	—	5	50	nA
			LM293	Total temperature	—	—	150	
			LM393	Total temperature	—	—	250	
Input bias current	$I_{IB}$	$V_O=1.4\text{V}$	$25^{\circ}\text{C}$	—	-25	-250	nA	
			Total temperature	—	—	-400		
common-mode	$V_{ICR}$	—	$25^{\circ}\text{C}$	$0\sim V_{CC}-1.5$	—	—	V	

input voltage			Total temperature	0~V <sub>CC</sub> -2	—	—		
Large signal differential amplification	A <sub>VD</sub>	V <sub>CC</sub> =18V, R <sub>L</sub> ≥15KΩ~V <sub>CC</sub> , V <sub>O</sub> =1.4~11.4V	25°C	50	200	—	V/mV	
Common-mode rejection ratio	CMRR	V <sub>CC</sub> =±15V, V <sub>CM</sub> = ±13V, V <sub>O</sub> =1.4V	25°C	—	84	—	dB	
Supply-voltage rejection ratio	PSRR	V <sub>DD</sub> = 5V to 10V	25°C	—	85	—	dB	
High level output current	I <sub>OH</sub>	V <sub>ID</sub> =1V	V <sub>OH</sub> =5V	25°C	—	0.1	50	nA
			V <sub>OH</sub> =36V	Total temperature	—	—	1	uA
Low level output voltage	V <sub>OL</sub>	V <sub>ID</sub> =-1V, I <sub>OL</sub> =4mA	25°C	—	130	400	mV	
			Total temperature	—	—	700		
Low level output current	I <sub>OL</sub>	V <sub>ID</sub> =-1V, V <sub>OL</sub> =1.5V	25°C	6	—	—	mA	
Operating current	I <sub>CC</sub>	V <sub>O</sub> =2.5V, no load.	25°C	—	0.5	1.2	mA	

### 3.4、AC Characteristics

(unless otherwise specified, T<sub>amb</sub>=25°C, V<sub>CC</sub>=5V).

Parameter name	Test strip		typical	Unit
Response time	R <sub>L</sub> pulls up 5.1KΩ to 5V, C <sub>L</sub> =15pF <sup>(1) (2)</sup>	100mV input, 5mV overdrive.	1.3	us
		TTL signal	0.3	

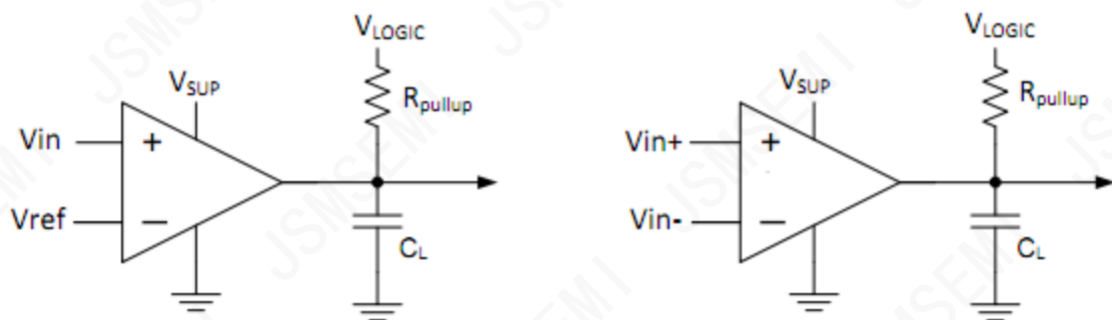
Note:

1: C<sub>L</sub> includes probe and fixture capacitance.

2. Response time refers to the interval between the rising edge of the input and the transient response when the output reaches 1.4V.

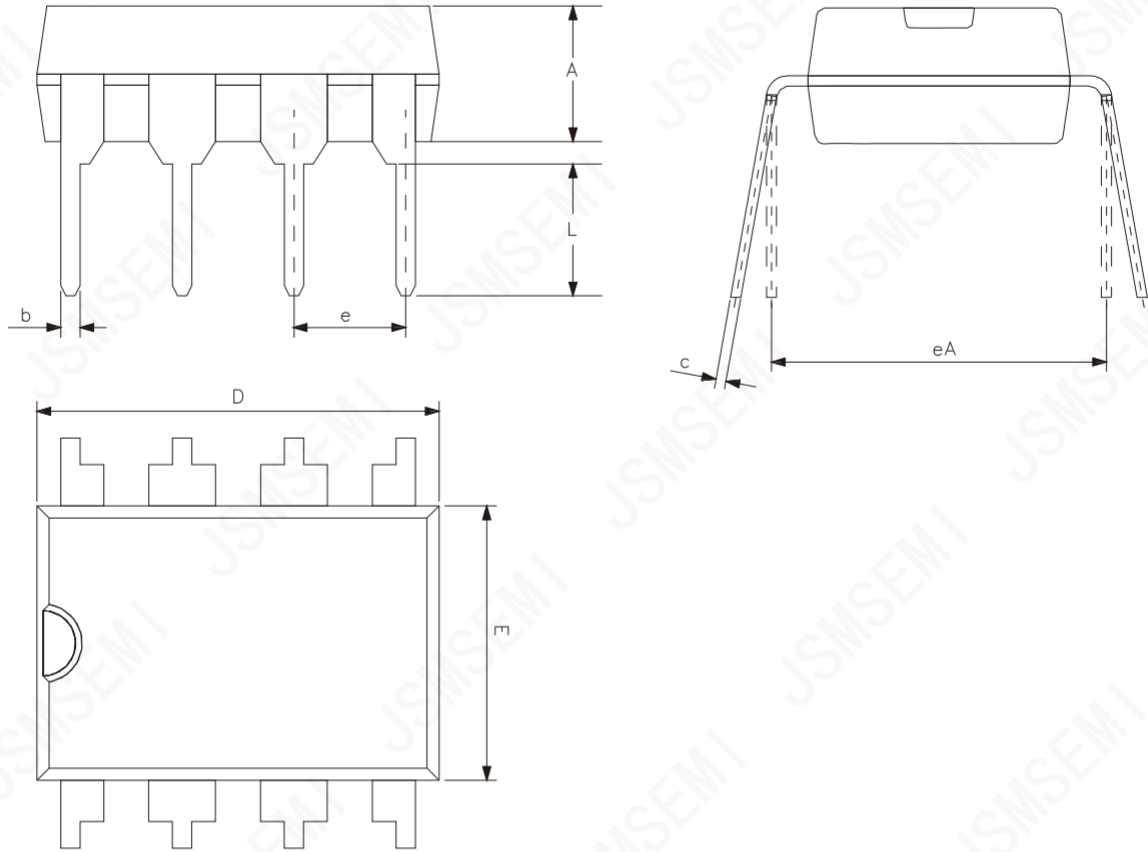
## 4、Typical Application Circuit And Application Note

### 4.1. Single-ended and differential comparator configurations



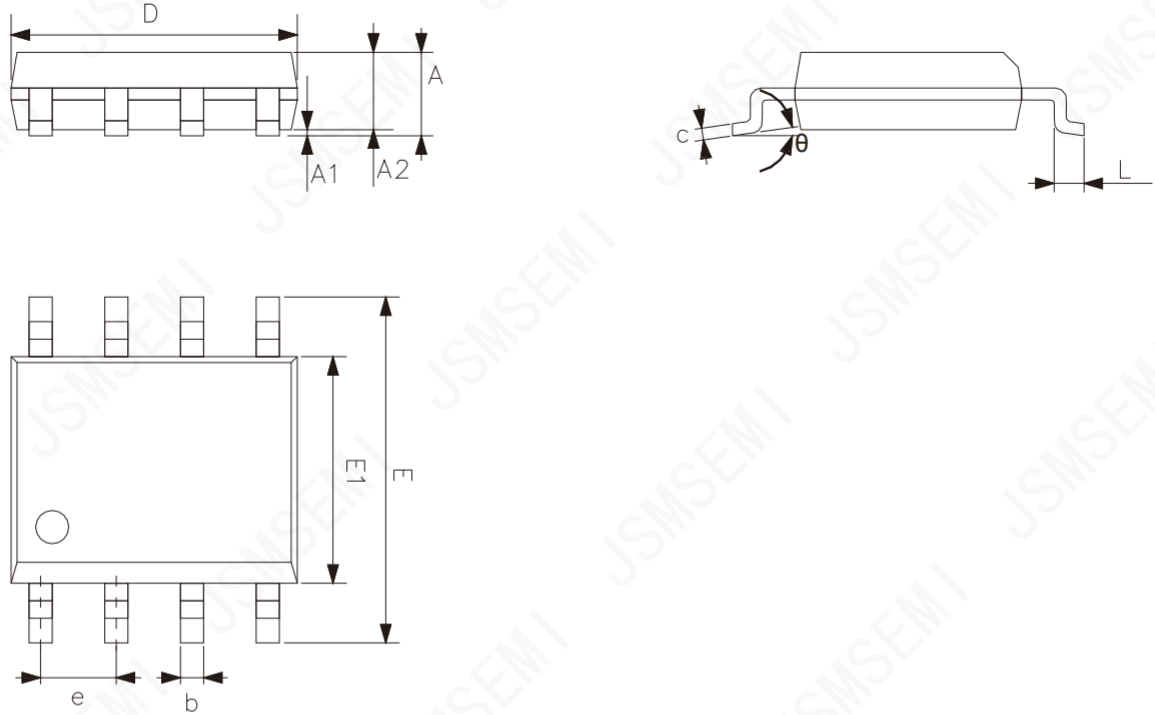
5、Package Information

5.1. DIP8



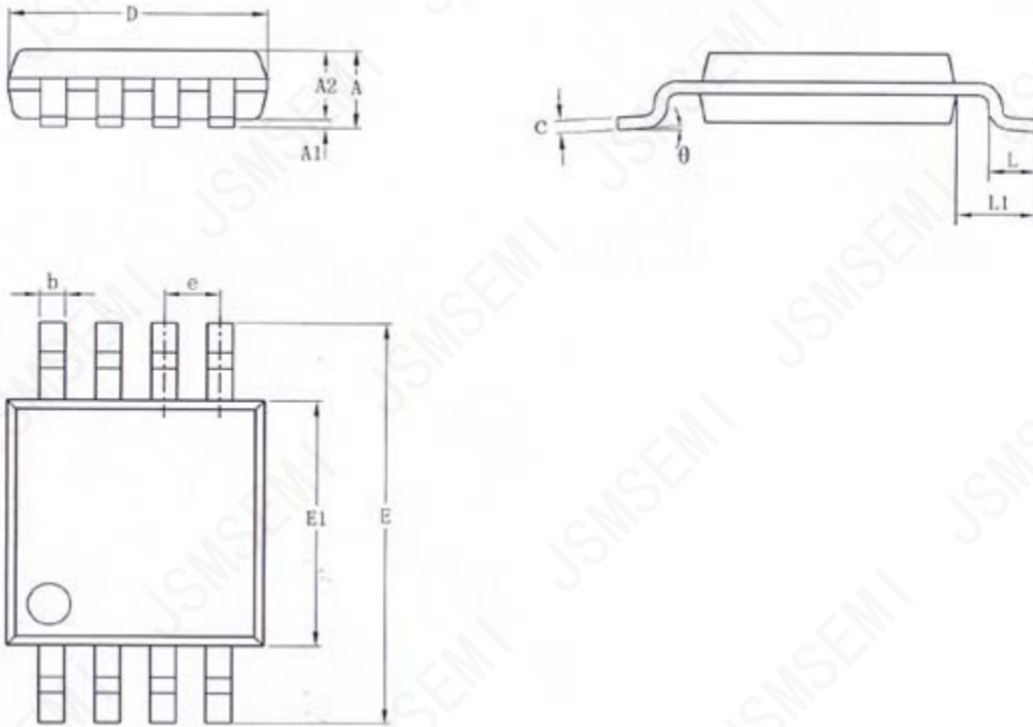
Symbol	Size (mm)	
	minimum	maximum
A	3.00	3.60
b	0.36	0.56
c	0.20	0.36
D	9.00	9.45
E	6.15	6.60
e	2.54	
eA	7.62	9.30
L	3.00	—

5.2、SOP8



Symbol	Size (mm)	
	minimum	maximum
A	1.35	1.80
A1	0.05	0.25
A2	1.25	1.55
D	4.70	5.10
E	5.80	6.30
E1	3.70	4.10
b	0.306	0.51
c	0.19	0.25
e	1.27	
L	0.40	0.89
$\theta$	0°	8°

## 5.3. MSOP8



Symbol	Size (mm)	
	minimum	maximum
A	—	1.10
A1	0.05	0.15
A2	0.75	0.95
b	0.22	0.38
c	0.08	0.23
D	2.90	3.10
E	4.70	5.10
E1	2.90	3.10
e	0.65	
L	0.40	0.80
L1	0.95	
θ	0°	8°

## 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.									

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