

# LM311

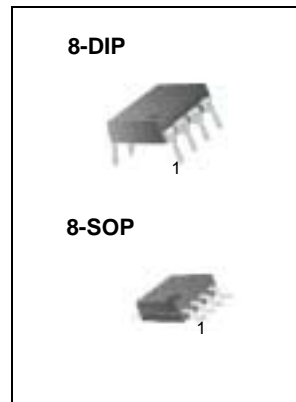
## Single Comparator

### Features

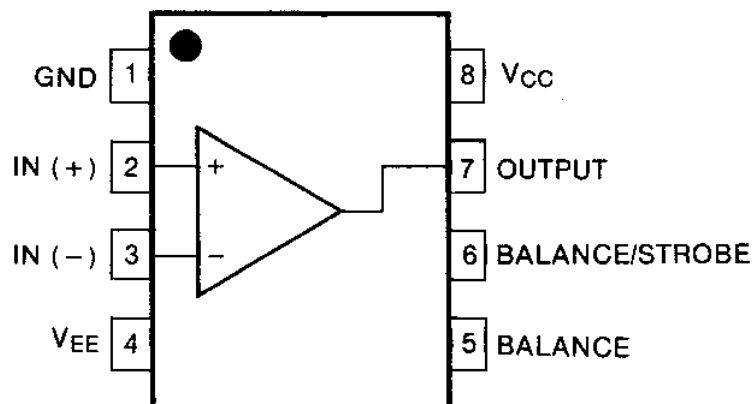
- Low input bias current : 250nA (Max)
- Low input offset current : 50nA (Max)
- Differential Input Voltage :  $\pm 30V$
- Power supply voltage : single 5.0V supply to  $\pm 15V$ .
- Offset voltage null capability.
- Strobe capability.

### Description

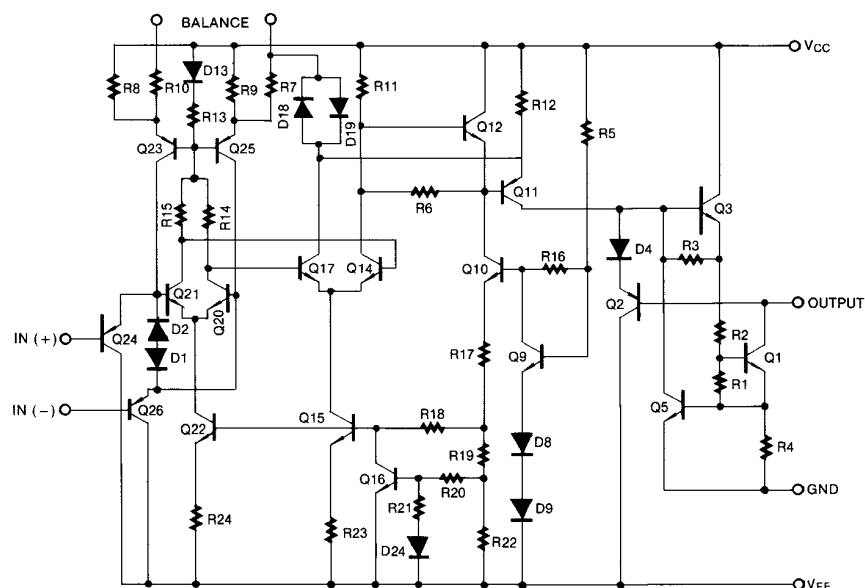
The LM311 series is a monolithic, low input current voltage comparator. The device is also designed to operate from dual or single supply voltage.



### Internal Block Diagram



## Schematic Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Total Supply Voltage	V <sub>CC</sub>	36	V
Output to Negative Supply Voltage LM311	V <sub>O</sub> - V <sub>EE</sub>	40	V
Ground to Negative voltage	V <sub>EE</sub>	-30	V
Differential Input Voltage	V <sub>I(DIFF)</sub>	30	V
Input Voltage	V <sub>I</sub>	±15	V
Output Short Circuit Duration	-	10	sec
Power Dissipation	P <sub>D</sub>	500	mW
Operating Temperature Range	T <sub>OPR</sub>	0 ~ +70	°C
Storage Temperature Range	T <sub>STG</sub>	- 65 ~ +150	°C

## Electrical Characteristics

(VCC = 15V, TA = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤ 50KΩ	-	1.0	7.5	mV
			Note 1	-	10	
Input Offset Current	I <sub>IO</sub>		-	6	50	nA
			Note 1	-	70	
Input Bias Current	I <sub>BIAS</sub>		-	100	250	nA
			Note 1	-	300	
Voltage Gain	G <sub>V</sub>	-	40	200	-	V/mV
Response Time	T <sub>RES</sub>	Note 2	-	200	-	ns
Saturation Voltage	V <sub>SAT</sub>	I <sub>O</sub> = 50mA, V <sub>I</sub> ≤ -10mV	-	0.75	1.5	V
		V <sub>CC</sub> ≥ 4.5V, V <sub>EE</sub> = 0V I <sub>O</sub> = 8mA, V <sub>I</sub> ≤ -10mV, Note 1	-	0.23	0.4	
Strobe "ON" Current	I <sub>STR(ON)</sub>	-	-	3	-	mA
Output Leakage Current	I <sub>SINK</sub>	I <sub>STR</sub> = 3mA, V <sub>I</sub> ≥ 10mV V <sub>O</sub> = 15V, V <sub>CC</sub> = ±15V	-	0.2	50	nA
Input Voltage Range	V <sub>I(R)</sub>	Note 1	-14.5 to 13.0	-14.7 to 13.8	-	V
Positive Supply Current	I <sub>CC</sub>	-	-	3.0	7.5	mA
Negative Supply Current	I <sub>EE</sub>	-	-	-2.2	-5.0	mA
Strobe Current	I <sub>STR</sub>	-	-	3	-	mA

### Notes :

1. 0 ≤ TA ≤ +70°C
2. The response time specified is for a 100mV input step with 5mV over drive.

## Typical Performance Characteristics

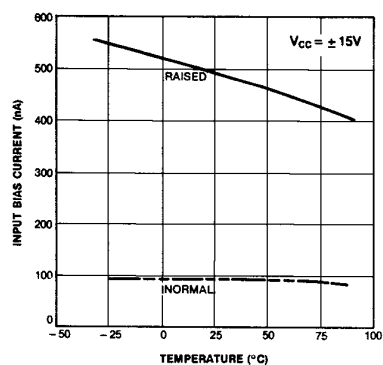


Figure 1. Input Bias Current vs Temperature

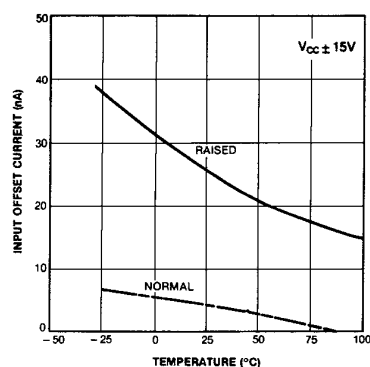


Figure 2. Input Offset Current vs Temperature

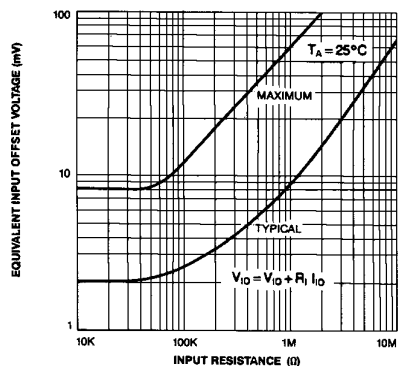


Figure 3. Offset Voltage vs Input Resistance

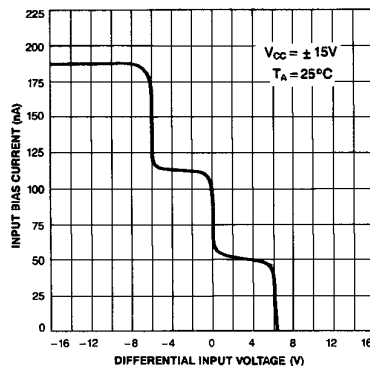


Figure 4. Input Bias Current vs Differential input voltage

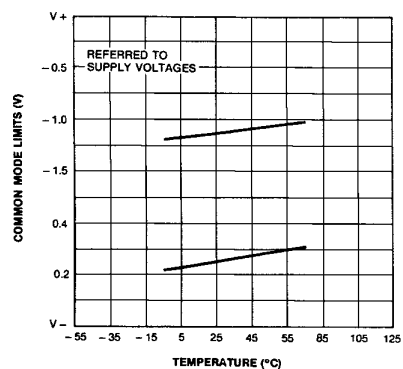


Figure 5. Common Mode Limits vs Temperature

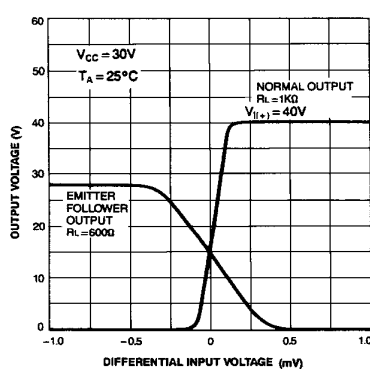


Figure 6. Output Voltage vs Differential input voltage

## Typical Performance Characteristics (continued)

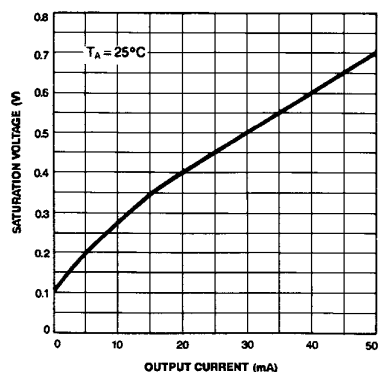


Figure 7. Saturation voltage vs Current

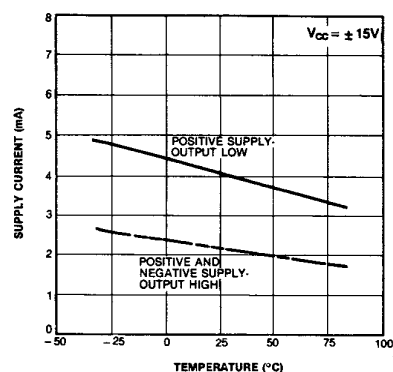


Figure 8. Supply Current vs Temperature

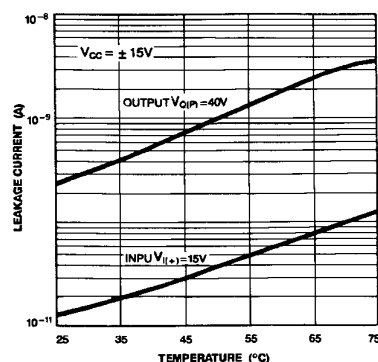


Figure 9. Leakage Current vs Temperature

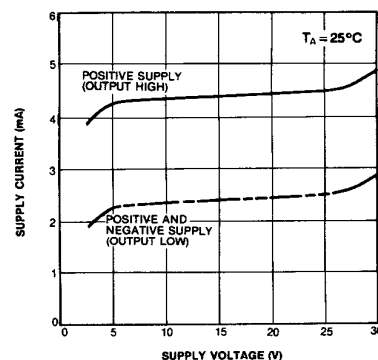


Figure 10. Supply Current vs Supply Voltage

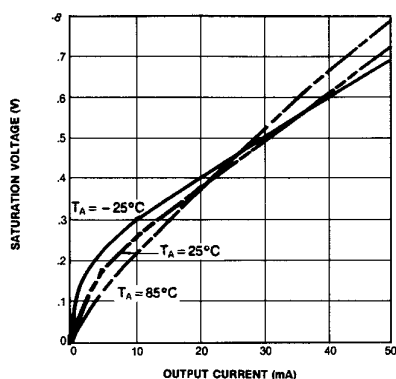


Figure 11. Current Saturation Voltage

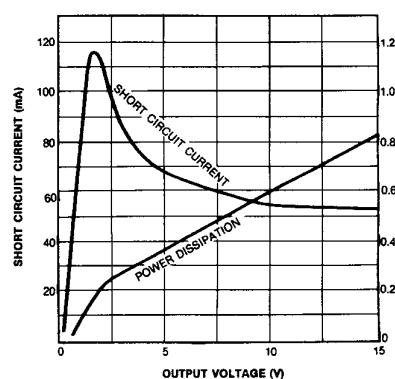
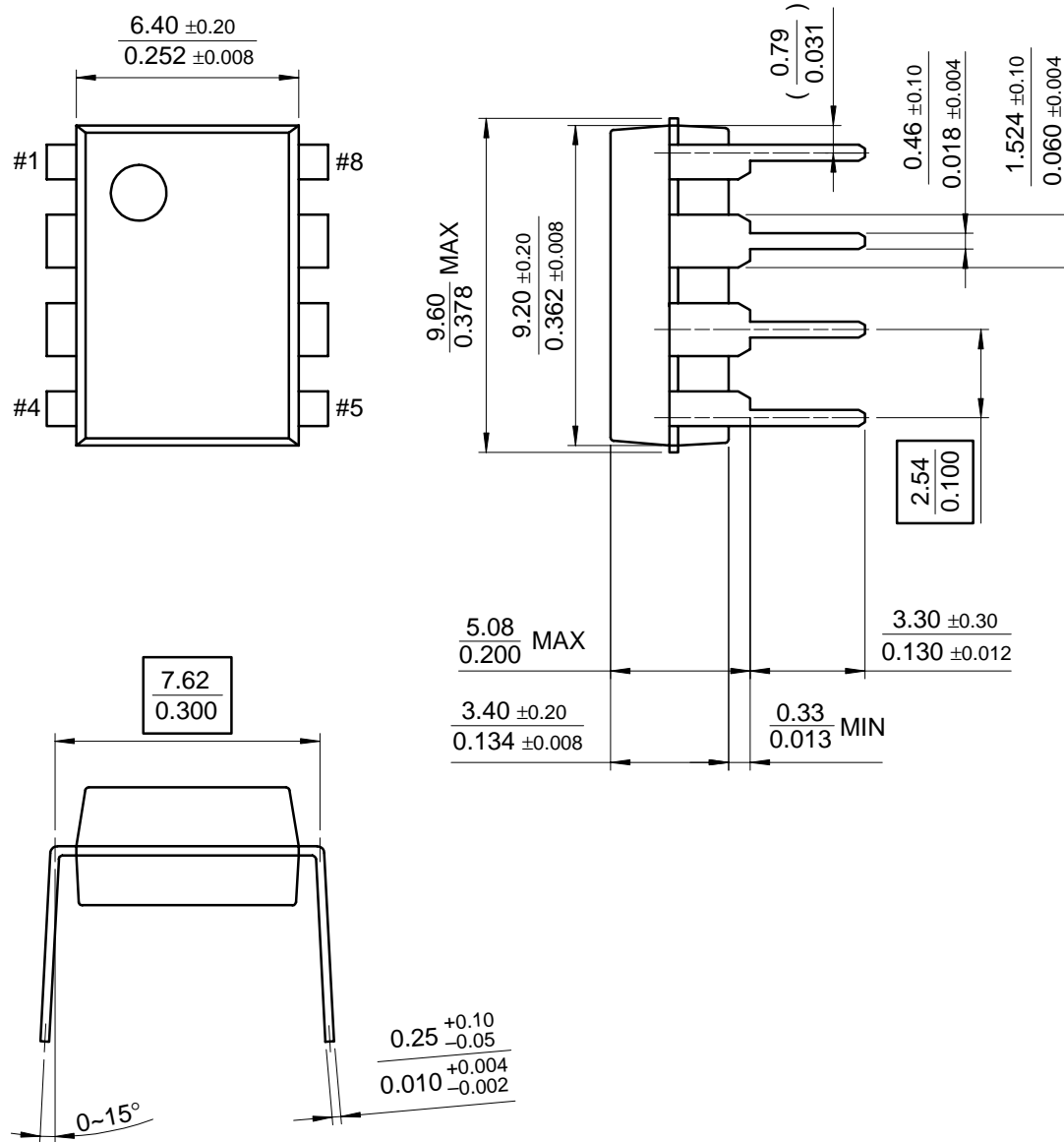


Figure 12. Output Limiting Characteristics

## Mechanical Dimensions

### Package

### 8-DIP





## Ordering Information

Product Number	Package	Operating Temperature
LM311N	8-DIP	0 ~ +70°C
LM311M	8-SOP	





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