



# LA6311M

## Precision Voltage Comparator

### Preliminary

#### Overview

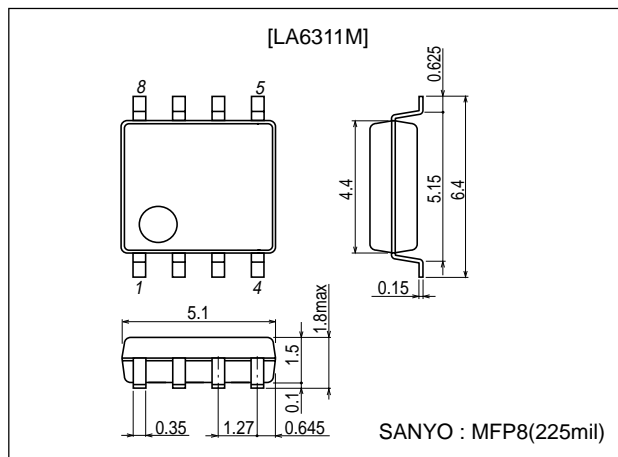
The LA6311M is a voltage comparator that has low input currents. It is also designed to operate over a wide range of supply voltages ; from  $\pm 15$  V op amp supplies down to the single 5 V supply used for IC logic. Its output is compatible with TTL as well as MOS circuits. Offset balancing is provided, and the outputs can be OR wired.

#### Features

- Response time (100 ns typ).
- Operating voltage (+6 V to +36 V).
- Single supply operation.
- Single circuit.
- With input offset trim terminal.
- Bipolar technology.
- Package outline (MFP8).

#### Package Dimensions

unit : mm  
3032B-MFP8



#### Specifications

Absolute Maximum Ratings at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V^+ / V^-$		$\pm 18$ (36)	V
Output-to-negative supply voltage	$V_{7-4}$		40	V
Ground-to-negative supply voltage	$V_{1-4}$		30	V
Differential input voltage	$V_{ID}$		$\pm 30$	V
Input voltage	$V_{IN}$		$\pm 15$ (note*)	V
Allowable power dissipation	PD		300	mW
Operating temperature	$T_{opr}$		-40 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

Note : \*For supply voltage less than  $\pm 15$  V, the absolute input voltage is equal to the supply voltage.

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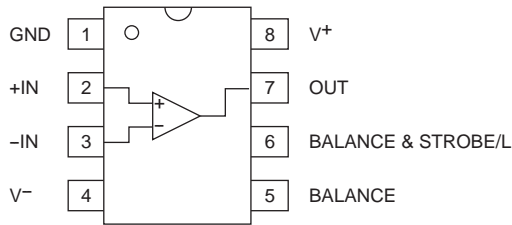
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# LA6311M

**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V^+ / V^- = \pm 15\text{ V}$

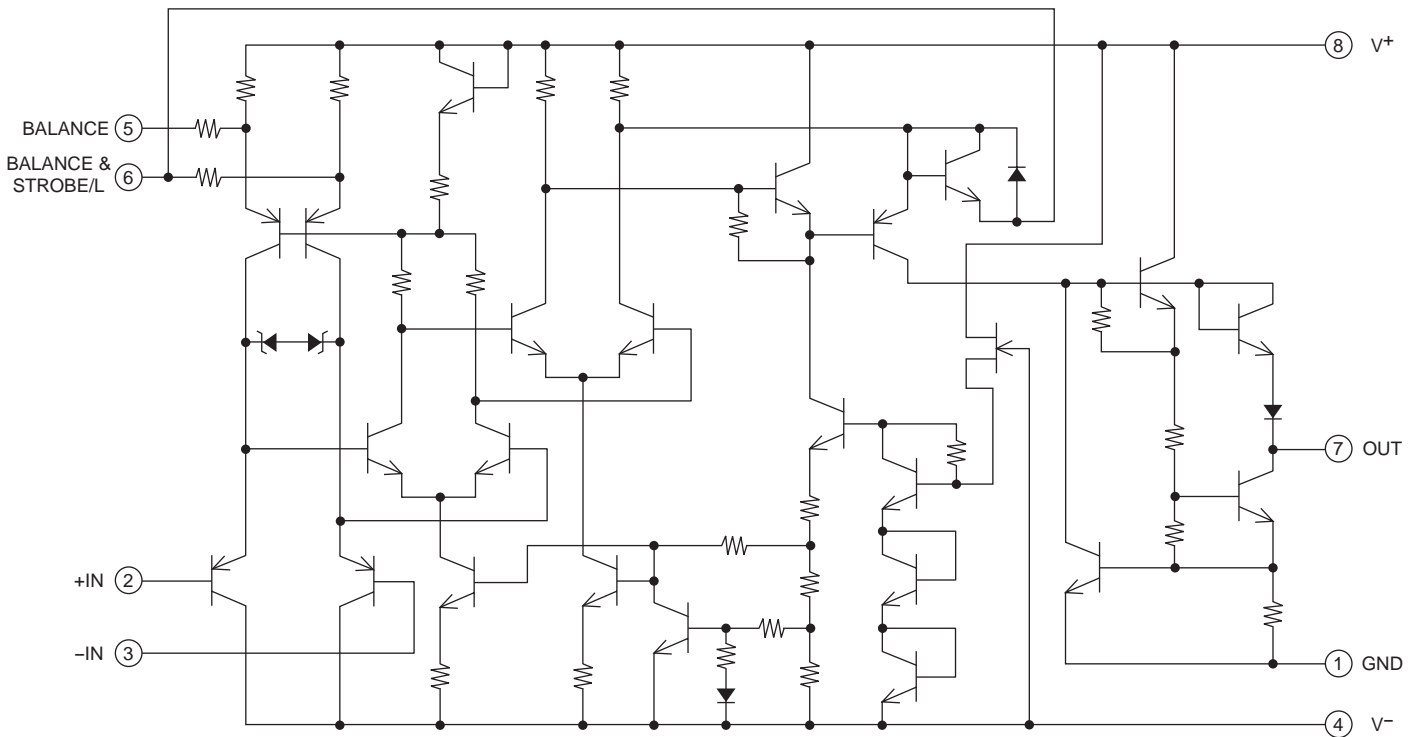
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input offset voltage	$V_{IO}$	$R_s \leq 50\text{ k}\Omega$		1.0	7.5	mV
Input offset current	$I_{IO}$			2.0	50	nA
Input bias current	$I_B$			70	220	nA
Voltage gain	$A_V$			110		dB
Response time	$t_R$			100		ns
Saturation voltage	$V_{SAT}$	$V_{IN} \geq 10\text{ mV}$ , $I_O = 50\text{ mA}$		0.65	1.0	V
Strobe ON current	$I_{STR}$			2.4		mA
Output leakage current	$I_{LEAK}$	$V_{IN} \leq -10\text{ mV}$ , $[V_O - V^-] = 35\text{ V}$		1	50	nA
Input common mode voltage	$V_{ICM}$			$\pm 14$		V
Positive quiescent current	$I^+$	$I_O = 0$		3.0	5.0	mA
Negative quiescent current	$I^-$	$I_O = 0$		1.5	2.5	mA

## Pin Assignment



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## Equivalent Circuit

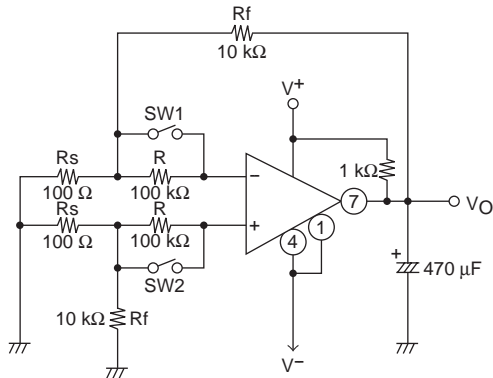


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# LA6311M

**Test Circuit** at  $V^{\pm} = \pm 15\text{ V}$ ,  $T_a = 25^{\circ}\text{C}$ , TYP

## 1. Input Offset Voltage ( $V_{IO}$ ), Input Offset Current ( $I_{IO}$ ), Input Base Current ( $I_B$ )



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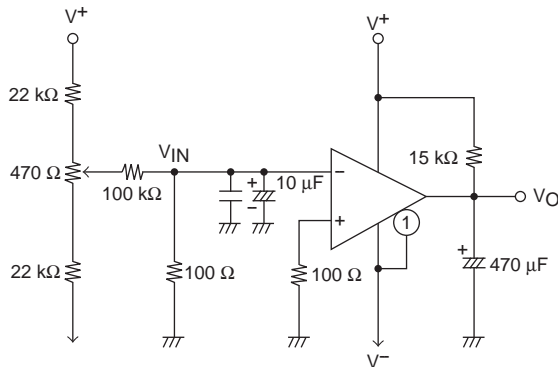
SW1	SW2	$V_O$
ON	ON	$V_{O1}$
OFF	OFF	$V_{O2}$
ON	OFF	$V_{O3}$
OFF	ON	$V_{O4}$

$$V_{IO} = \frac{|V_{O1}|}{1 + \frac{R_f}{R_s}} \quad [\text{V}]$$

$$I_{IO} = \frac{|V_{O2} - V_{O1}|}{R \left[ 1 + \frac{R_f}{R_s} \right]} \quad [\text{A}]$$

$$I_B = \frac{|V_{O4} - V_{O3}|}{2R \left[ 1 + \frac{R_f}{R_s} \right]} \quad [\text{A}]$$

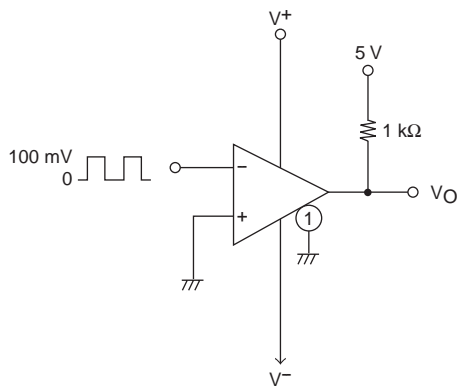
## 2. Voltage Gain ( $A_V$ )



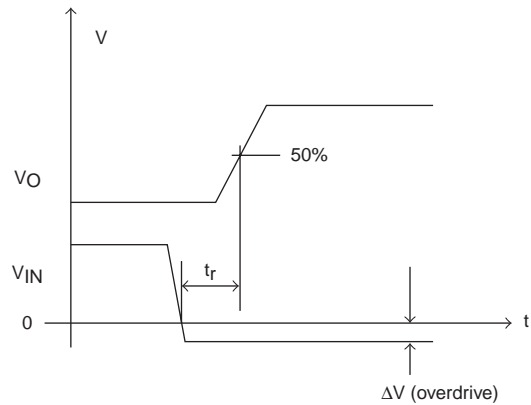
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$$A_V = 20 \log \left[ \frac{V_{O1} - V_{O2}}{V_{IN1} - V_{IN2}} \right] \quad (\text{dB})$$

## 3. Response Time ( $t_R$ )

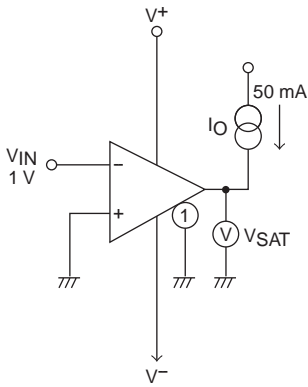


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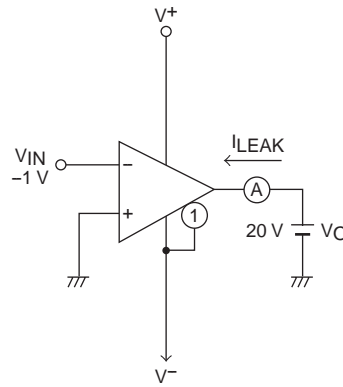
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4.Saturation Voltage (VSAT)



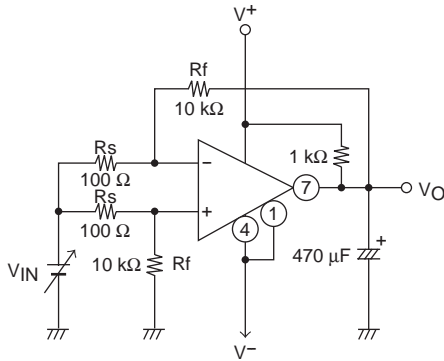
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5.Output Leakage Current (ILEAK)



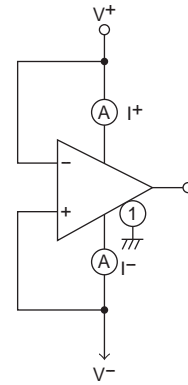
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6.Input Common Mode Voltage (VICM)



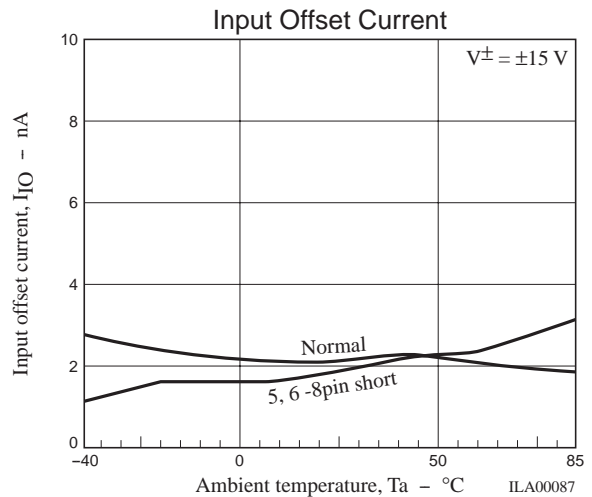
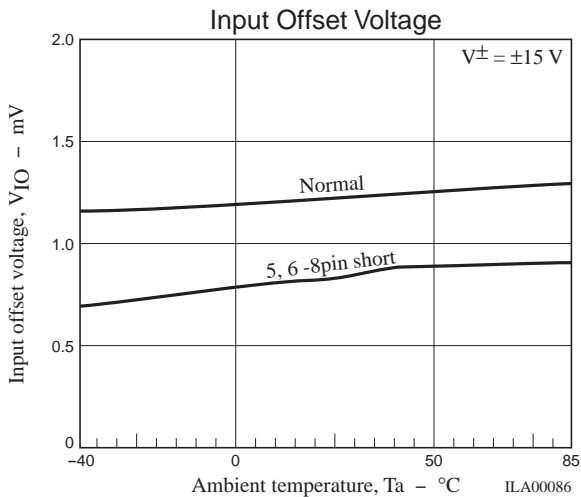
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7.Supply Current (ICC)

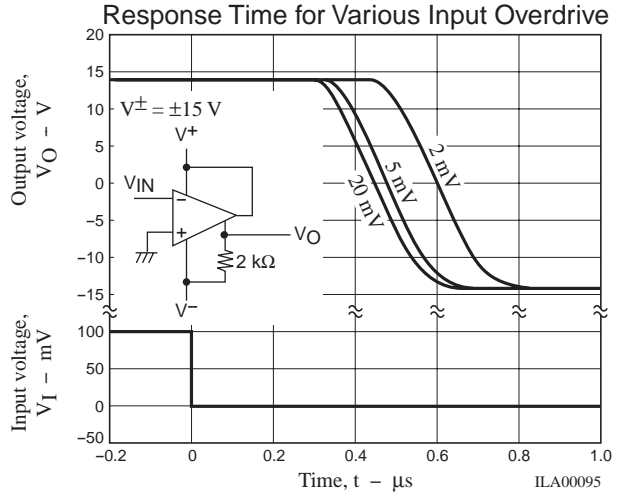
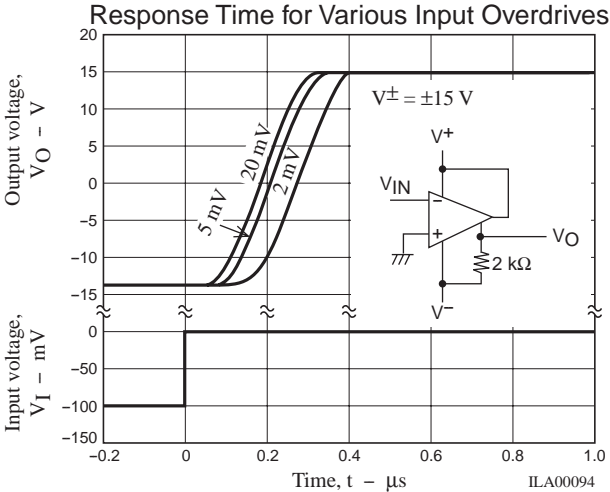
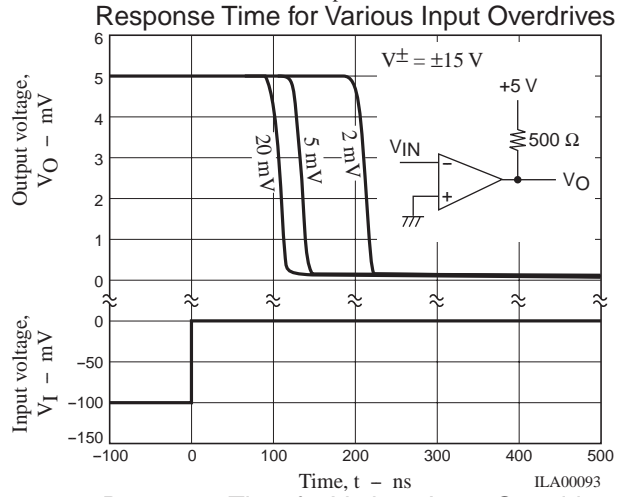
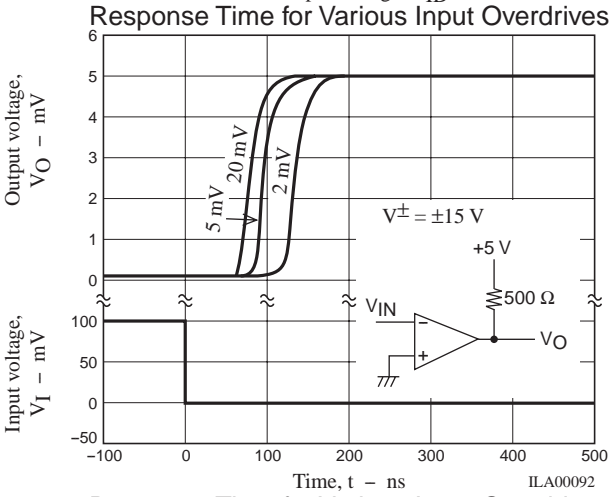
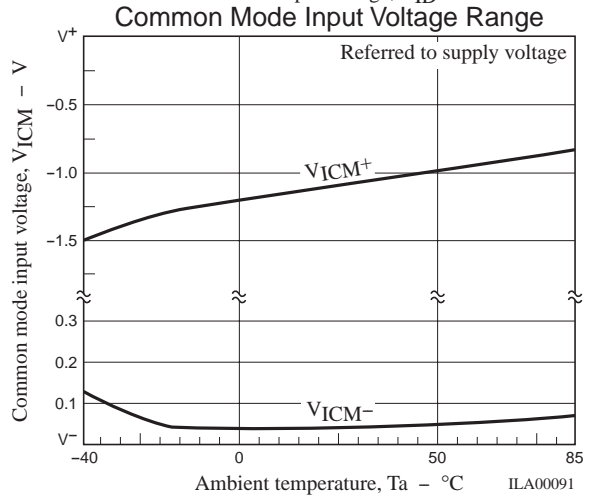
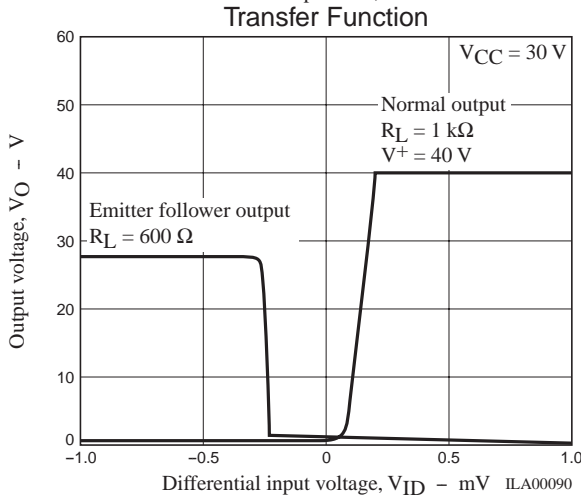
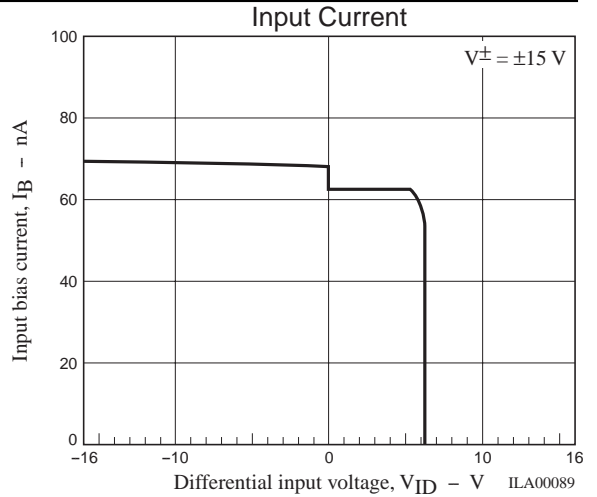
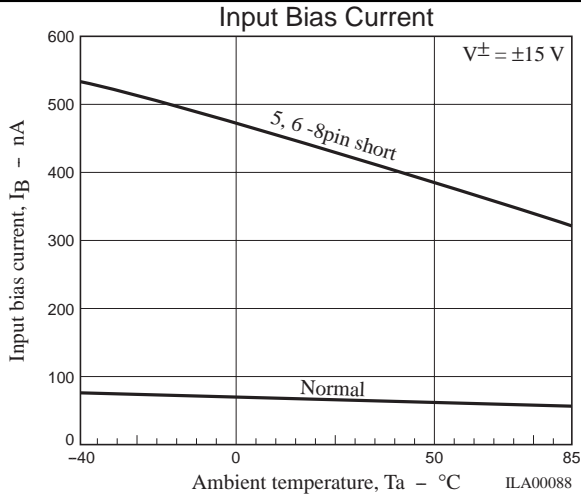


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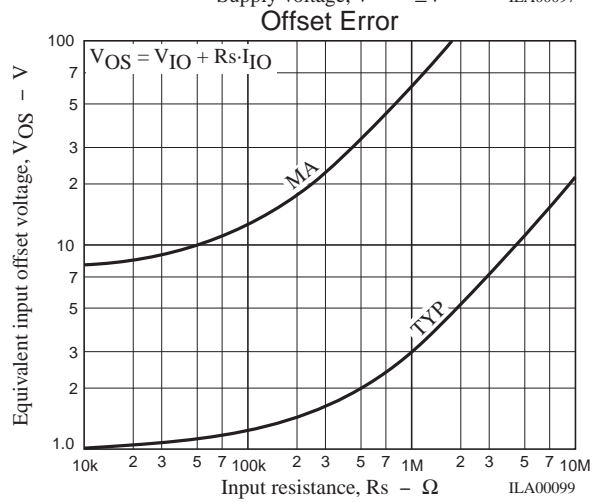
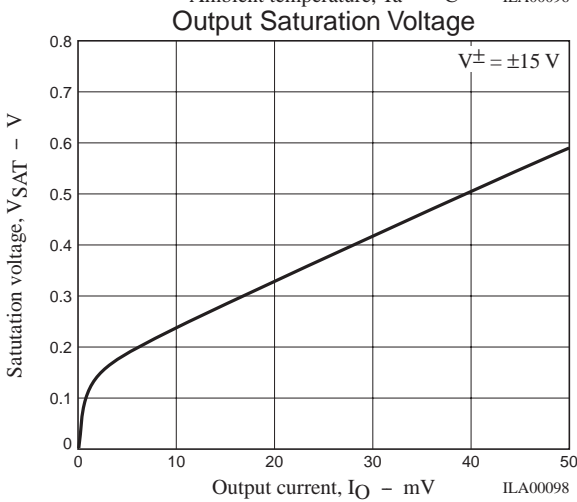
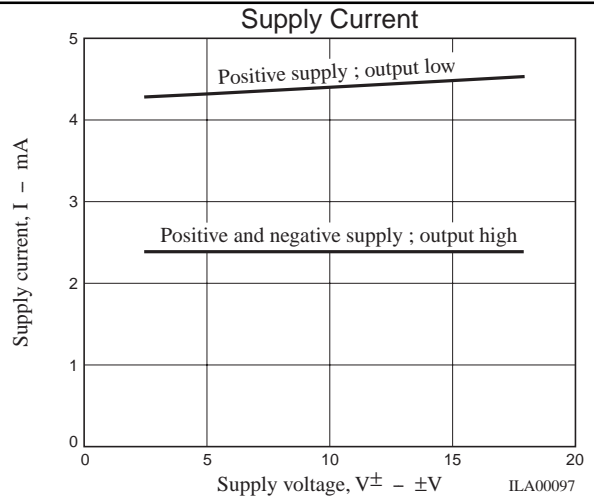
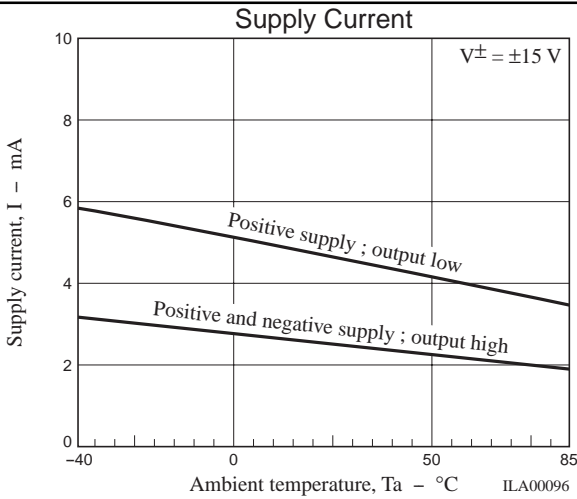
Typical Characteristics at Ta = 25°C, TYP



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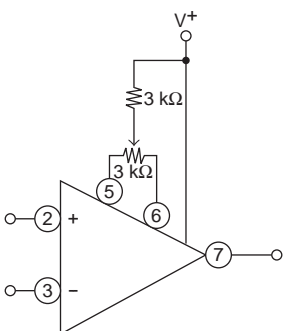


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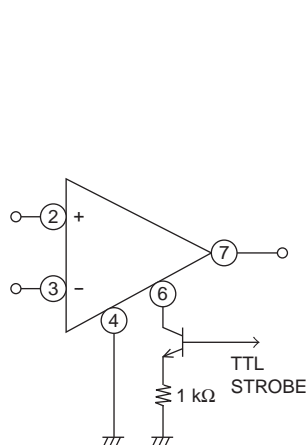
## Typical Connection and Applications

OFFSET VOLTAGE NULL CIRCUIT



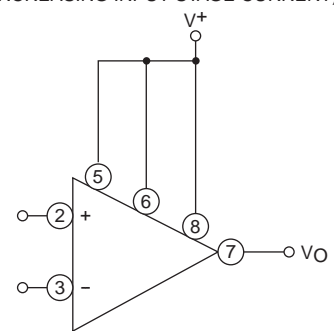
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STROBING CIRCUIT



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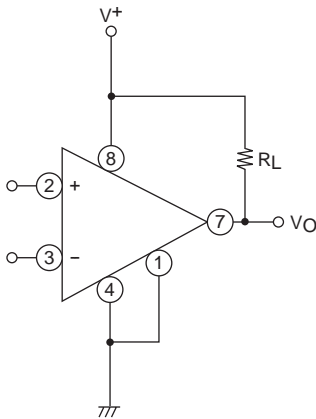
FAST RESPONSE CIRCUIT  
(INCREASING INPUT STAGE CURRENT)



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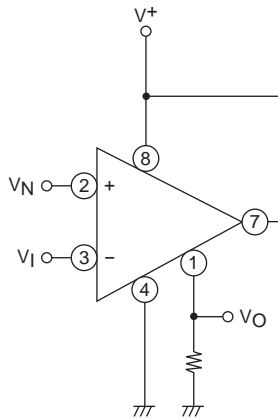
# LA6311M

OPEN COLLECTOR OUTPUT



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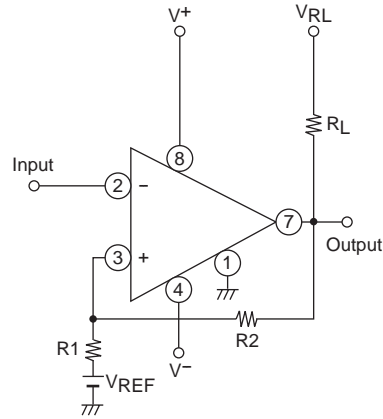
EMITTER FOLLOWER OUTPUT



Input polarity is reversed when 1pin (GND) is used as an output.  
 $V_N > V_I \rightarrow V_O : \text{Low}$

ILA00104

COMPARATOR with HYSTERESIS CIRCUIT



Threshold voltage ( $V_{TH}$ )  
 $V_{TH} (\text{high}) = V_{REF} + (V_{RL} - V_{REF}) \frac{R1}{RL + R2 + R1}$   
 $V_{TH} (\text{low}) = V_{REF} + (V_{RL} - V_{OL}) \frac{R1}{R1 + R2}$   
 $(V_{RL} > V_{REF} ; V_{RL} > V_{OL})$

ILA00105

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