Signetics

LM111/211/311
Voltage Comparator

Product Specification

Linear Products

DESCRIPTION

The LM111 series are voltage comparators that have input currents approximately a hundred times lower than devices like the μA710. They are designed to operate over a wider range of supply voltages; from standard ± 15V op amp supplies down to the single 5V supply used for IC logic. Their output is compatible with RTL, DTL, and TTL as well as MOS circuits. Further, they can drive lamps or relays, switching voltages up to 50V at currents as high as 50mA.

Both the inputs and the outputs of the LM111 series can be isolated from system ground, and the output can drive loads referred to ground, the positive supply, or the negative supply. Offset balancing and strobe capability are provided and outputs can be wire-ORed.

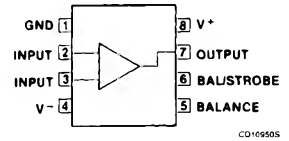
Although slower than the μA710 (200ns response time vs 40ns), the devices are also much less prone to spurious oscillations. The LM111 series has the same pin configuration as the μA710 series.

FEATURES

- **Operates from single 5V supply**
- **Maximum input bias current: 150nA (LM311 — 250nA)**
- **Maximum offset current: 20nA (LM311 — 50nA)**
- **Differential input voltage range: ± 30V**
- **Power consumption: 135mW at ± 15V**
- **High sensitivity — 200V/mV**

PIN CONFIGURATION

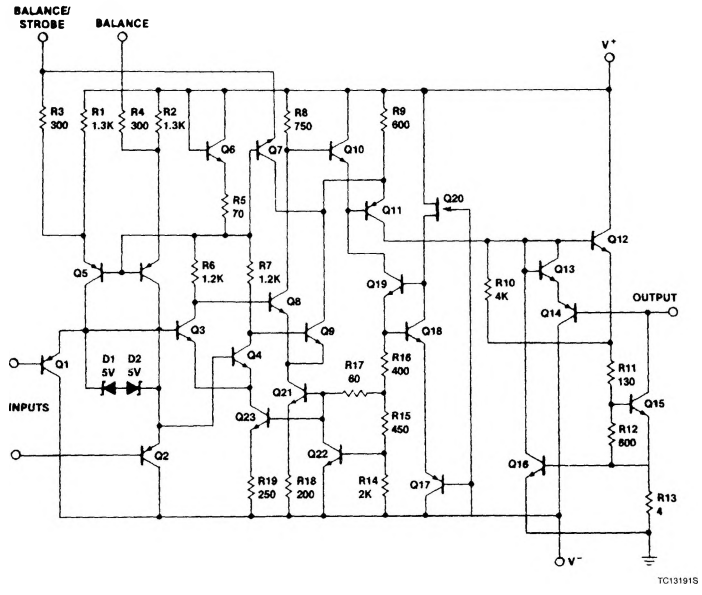
D, FE, N Packages



APPLICATIONS

- **Zero crossing detector**
- **Precision squarer**
- **Positive/negative peak detector**
- **Low voltage adjustable reference supply**
- **Switching power amplifier**

EQUIVALENT SCHEMATIC



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
8-Pin Cerdip	−55°C to +125°C	LM111FE
8-Pin Cerdip	−25°C to +85°C	LM211FE
8-Pin Plastic DIP	−25°C to +85°C	LM211N
8-Pin Plastic SO	0 to +70°C	LM311D
8-Pin Cerdip	0 to +70°C	LM311FE
8-Pin Plastic DIP	0 to +70°C	LM311N
8-Pin Plastic SO	−25°C to +85°C	LM211D

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_S	Total supply voltage	36	V
	Output to negative supply voltage: LM111/LM211 LM311	 50 40	 V V
	Ground to negative supply voltage	30	V
	Differential input voltage	±30	V
V_{IN}	Input voltage[1]	±15	V
$P_{D\ MAX}$	Maximum power dissipation, T_A = 25°C (still-air)[1] F package N package D package	 810 1190 780	 mW mW mW
I	Output short-circuit duration	10	sec
T_A	Operating ambient temperature range LM111 LM211 LM311	 −55 to +125 −25 to +85 0 to +70	 °C °C °C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTE:

1. Derate above 25°C, at the following rates:
   F package at 6.4mW/°C
   N package at 9.5mW/°C
   D package at 6.2m/W°C

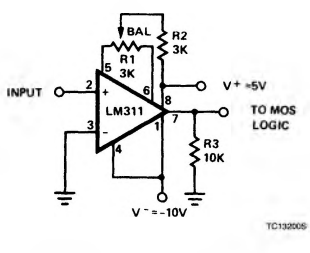
DC ELECTRICAL CHARACTERISTICS [1, 2, 3]

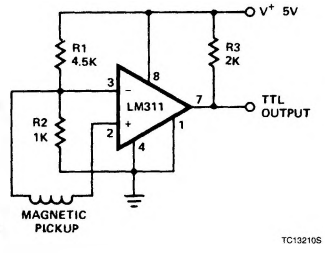
SYMBOL	PARAMETER	TEST CONDITIONS	LM111/LM211			LM311			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Input offset voltage[3]	$T_A = 25°C$, $R_S \leq 50k\Omega$		0.7	3.0		2.0	7.5	mV
I_{OS}	Input offset current[3]	$T_A = 25°C$		4.0	10		6.0	50	nA
I_{BIAS}	Input bias current	$T_A = 25°C$		60	100		100	250	nA
A_V	Voltage gain	$T_A = 25°C$		200			200		V/mV
	Response time[4]	$T_A = 25°C$		200			200		ns
	Saturation voltage	$V_{IN} \leq -5mV$, $I_{OUT} = 50mA$							
V_{SAT}		$T_A = 25°C$		0.75	1.5		0.75	1.5	V
$I_{BAL/STR}$	Strobe on current	$T_A = 25°C$		3.0			3.0		mA
	Output leakage current	$V_{IN} \geq 5mV$, $V_{OUT} = 35V$							
$I_{LEAKAGE}$		$T_A = 25°C$, $I_{STROBE} = 3mA$		0.2	10		0.2	50	nA
V_{OS}	Input offset voltage[3]	$R_S \leq 50k\Omega$			4.0			10	mV
I_{OS}	Input offset current[3]				20			70	nA
I_{BIAS}	Input bias current				150			300	nA
V_{IN}	Input voltage range	$V = \pm 15V$ (Pin 7 may go to 5V)	-14.5	13.8 -14.7	13.0	-14.5	13.8 -14.7	13.0	V
	Saturation voltage	$V=p0 \geq 4.5V$, $V- = 0$							
V_{OL}		$V_{IN} \leq -6mV$, $I_{SINK} \leq 8mA$		0.23	0.4		0.23	0.4	V
I_{OH}	Output leakage current	$V_{IN} \geq 5mV$, $V_{OUT} = 35V$		0.1	0.5				μA
I_{CC}	Positive supply current	$T_A = 25°C$		5.1	6.0		5.1	7.5	mA
I_{EE}	Negative supply voltage	$T_A = 25°C$		4.1	5.0		4.1	5.0	mA

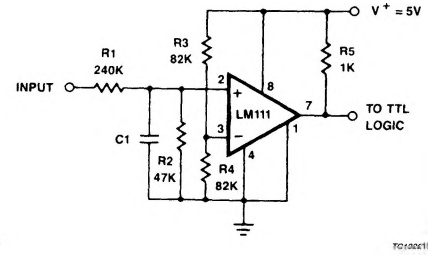
NOTES:

1. This rating applies for ± 15V supplies. The positive input voltage limit is 30V above the negative supply. The negative input voltage limit is equal to the negative supply voltage or 30V below the positive supply, whichever is less.
2. These specifications apply for $V_S = \pm 15V$ and $0°C < T_A < 70°C$ unless otherwsie specified. With the LM211, however, all temperature specifications are limited to $-25°C \leq T_A \leq 85°C$ and for the LM111 is limited to $-55°C < T_A < 125°C$. The offset voltage, offset current, and bias current specifications apply for any supply voltage from a single 5V supply up to ± 15V supplies.
3. The offset voltages and offset currents given are the maximum values required to drive the output within a volt of either supply with 1mA load. Thus, these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.
4. The response time specified is for a 100mV input step with 5mV overdrive.
5. Do not short the strobe pin to ground; it should be current driven at 3mA to 5mA.

TYPICAL APPLICATIONS







* Values shown are for a 0 to 30V logic swing and a 15V threshold.
† May be added to control speed and reduce susceptibility to noise spikes.

Zero-Crossing Detector Driving MOS Logic | **Detector for Magnetic Transducer** | **TTL Interface with High Level Logic**