

Voltage comparator with strobe

Description

The LM211, LM311 are voltage comparators that have low input currents.

They are also designed to operate over a wide range of supply voltages: from standard ± 15 V operational amplifier supplies down to the single +5 V supply used for IC logic.

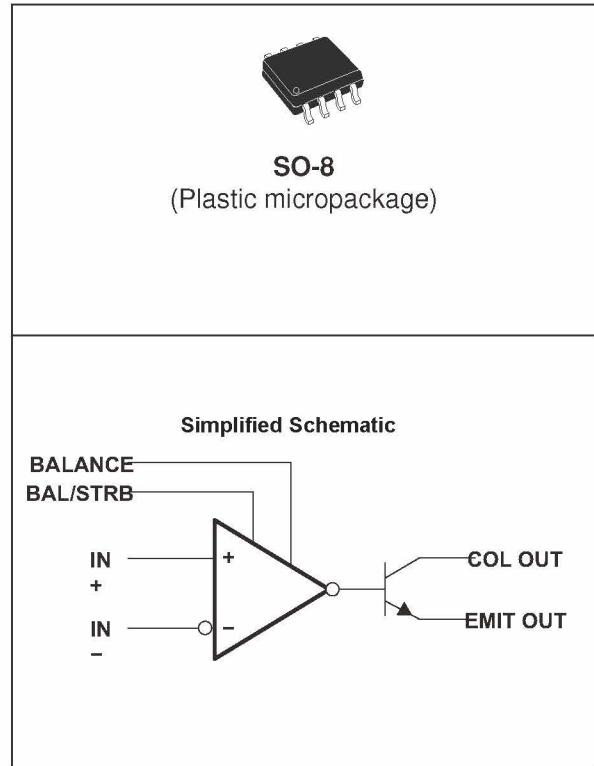
Their output is compatible with RTL-DTL and TTL as well as MOS circuits and can switch voltages up to +50 V at output currents as high as 50 mA.

Features

- Fast Response Time: 165 ns
- Strobe Capability
- Maximum Input Bias Current: 300 nA
- Maximum Input Offset Current: 70 nA
- Can Operate From Single 5-V Supply
- Available in Q-Temp Automotive
 - High-Reliability Automotive Applications
 - Configuration Control and Print Support
 - Qualification to Automotive Standards

Applications

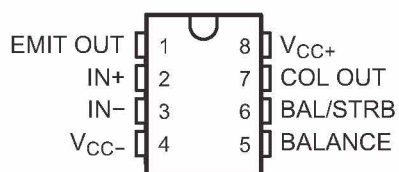
- Desktop PCs
- Body Control Modules
- White Goods
- Building Automation
- Oscillators
- Peak Detectors



Ordering Information

Part Number	Package	Packing	Temperature(TA)	Package Qty
LM311DR	SOIC-8	Reel	0°C ~ 70°C	2500
LM211DR	SOIC-8	Reel	-40°C ~ 85°C	2500

Pin Configuration and Functions

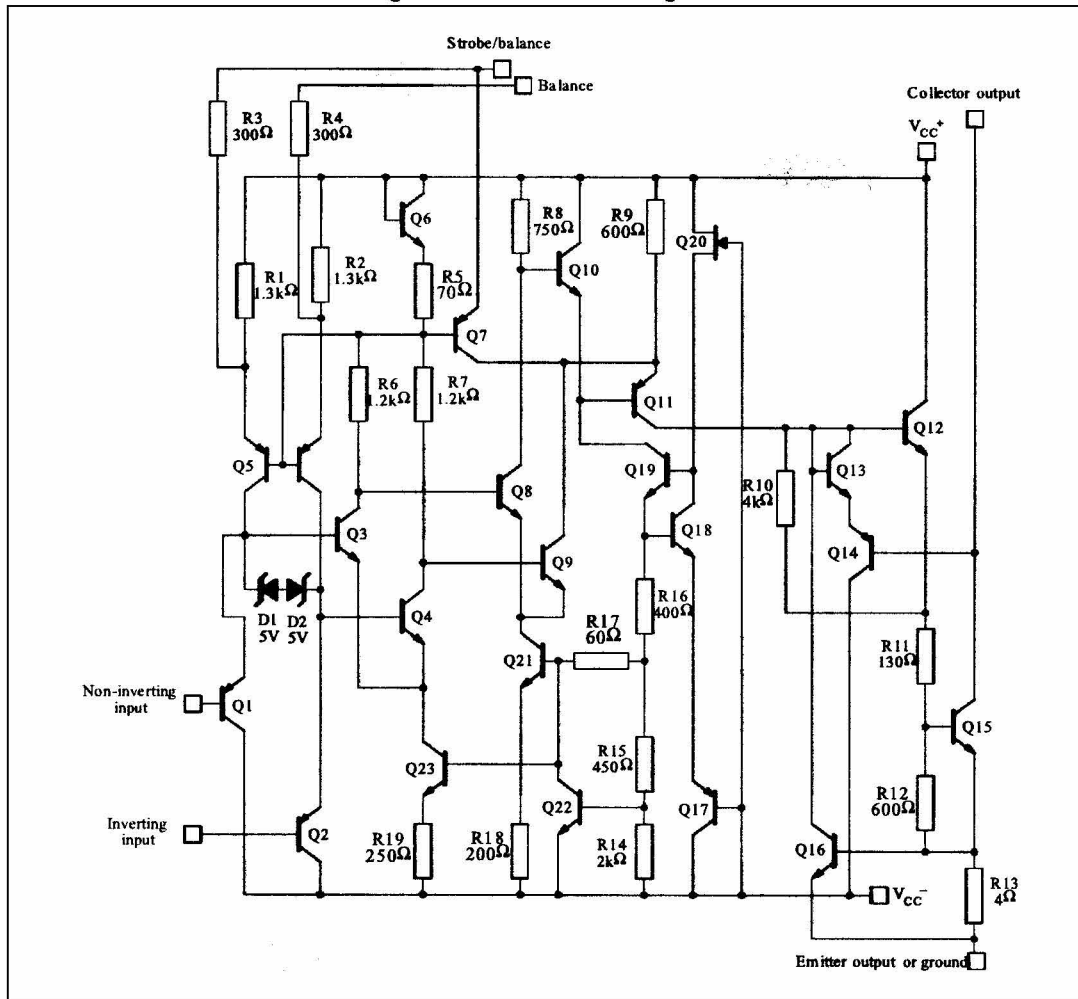


Pin Functions

NAME	PIN		I/O	DESCRIPTION
	LM211, SOIC	LM311 SOIC		
IN+	2	2	I	Noninverting comparator
IN-	3	3	I	Inverting input comparator
BALANCE	5	5	I	Balance
BAL/STRB	6	6	I	Strobe
COL OUT	7	7	O	Output collector comparator
EMIT OUT	1	1	O	Output emitter comparator
V _{CC-}	4	4	—	Negative supply
V _{CC+}	8	8	—	Positive supply

1 Schematic diagram

Figure 1. Schematic diagram



2 Absolute maximum ratings & operating conditions

Table 2. Absolute maximum ratings (AMR)

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	36	V
V_{id}	Differential input voltage	± 30	V
V_i	Input voltage ⁽¹⁾	± 15	V
$V_{(1-4)}$	Ground to negative supply voltage	30	V
$V_{(7-4)}$	Output to negative supply voltage		V
	LM211	50	
	LM311	40	
	Output short-circuit duration	10	s
	Voltage at strobe pin	$V_{CC}^+ - 5$	V
P_d	Power dissipation ⁽²⁾		mW
	SO-8	710	
T_j	Junction temperature	+150	°C
T_{stg}	Storage temperature range	-65 to +150	°C
ESD	Human Body Model (HBM)	800	V
	Charged Device Model (CDM)	1500	
	Machine Model (MM)	200	

1. This rating applies for $\pm 15V$ supplies. The positive input voltage limit is 30V above the negative. The negative input voltage is equal to the negative supply voltage or 30V below the positive supply, whichever is less.
2. P_d is calculated with $T_{amb} = +25^\circ C$, $T_j = +150^\circ C$ and $R_{thja} = 175^\circ C/W$ for the SO-8 package.

Table 3. Operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	3.5 to 30	V
T_{oper}	Operating free-air temperature range		°C
	LM211	-40 to +85	
	LM311	0 to +70	

3 Electrical characteristics

Table 4. $V_{CC+} = \pm 15\text{ V}$, $T_{amb} = +25\text{ }^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Conditions	LM211			LM311			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input offset voltage ⁽¹⁾	$R_S \leq 50\text{k}\Omega$ $T_{amb} = +25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		0.7	3 4		2	7.5 10	mV
I_{io}	Input offset current ⁽¹⁾	$T_{amb} = +25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		4	10 20		6	50 70	nA
I_{ib}	Input bias current ⁽¹⁾	$T_{amb} = +25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		60	100 150		100	250 300	nA
A_{vd}	Large signal voltage gain		40	200		40	200		V/mV
I_{CC+} I_{CC-}	Supply currents	Positive Negative		5.1 4.1	6 5		5.1 4.1	7.5 5	mA
V_{icm}	Input common mode voltage range	$T_{min} \leq T_{amb} \leq T_{max}$	-14.5	+13.8 -14.7	+13	-14.5	+13.8 -14.7	+13	V
V_{OL}	Low level output voltage	$T_{amb} = +25^\circ\text{C}$, $I_O = 50\text{mA}$, $V_i \leq -5\text{mV}$		0.75	1.5				V
		$T_{amb} = +25^\circ\text{C}$, $I_O = 50\text{mA}$, $V_i \leq -10\text{mV}$				0.75	1.5		
		$T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC+} \geq +4.5\text{V}$, $V_{CC-} = 0$ $I_O = 8\text{mA}$, $V_i \leq -6\text{m}$		0.23	0.4				
		$T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC+} \geq +4.5\text{V}$, $V_{CC-} = 0$ $I_O = 8\text{mA}$, $V_i \leq -10\text{mV}$				0.23	0.4		
I_{OH}	High level output current	$T_{amb} = +25^\circ\text{C}$ $V_i \geq +5\text{mV}$, $V_O = +35\text{V}$		0.2	10				nA
		$T_{amb} = +25^\circ\text{C}$ $V_i \geq +10\text{mV}$, $V_O = +35\text{V}$				0.2	50		nA
		$T_{min} \leq T_{amb} \leq T_{max}$ $V_i \geq +5\text{mV}$, $V_O = +35\text{V}$		0.1	0.5				μA
I_{strobe}	Strobe current			3		3		mA	
t_{re}	Response time ⁽²⁾			200		200		ns	

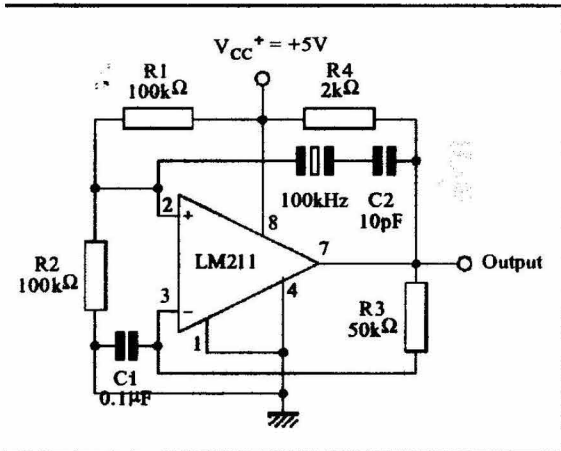
1. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5 V supply up to $\pm 15\text{ V}$ supplies. The offset voltages and offset currents given are the maximum values required to drive the output down to +1 V or up to +14 V with a 1 mA load current. Thus, these parameters define an error band and take into account the worst-case of voltage gain and input impedance.

2. The response time specified is for a 100 mV input step with 5 mV overdrive.

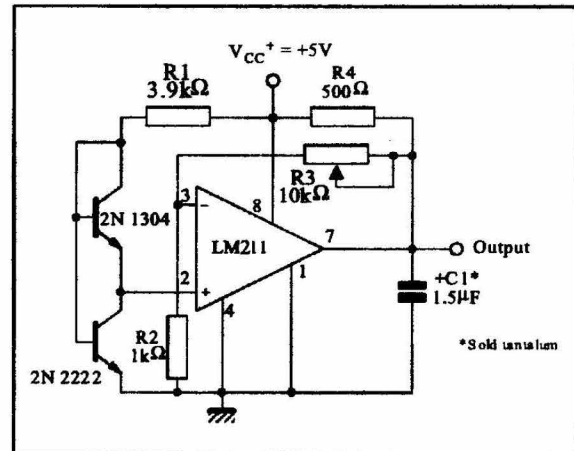
4 Typical application schematics

TYPICAL APPLICATIONS

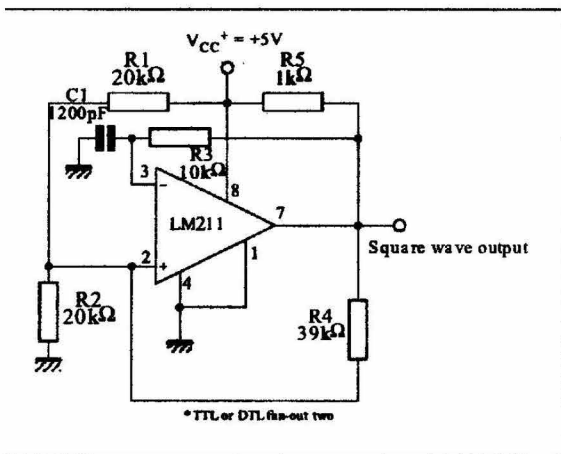
CRYSTAL OSCILLATOR



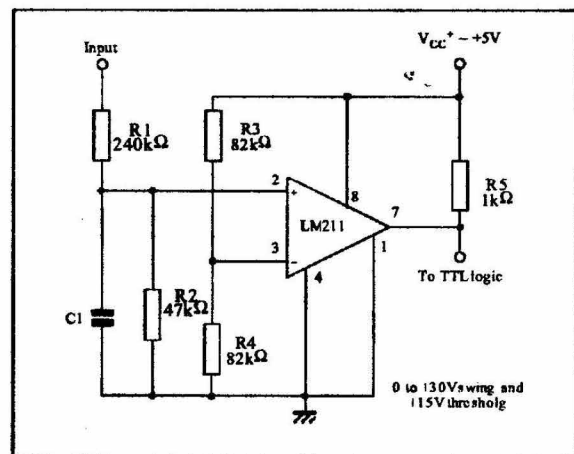
LOW VOLTAGE ADJUSTABLE REFERENCE SUPPLY



100kHz FREE RUNNING MULTIVIBRATOR

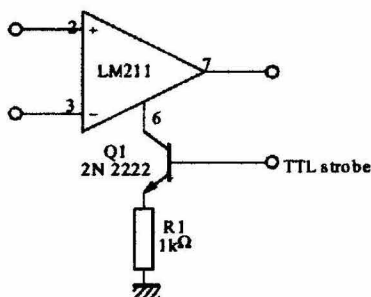


TTL INTERFACE WITH HIGH LEVEL LOGIC

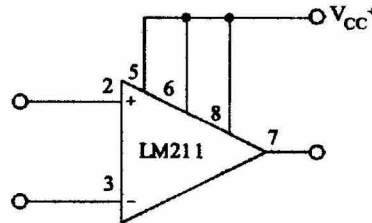


AUXILIARY CIRCUITS

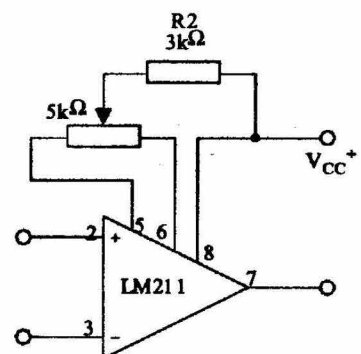
STROBE



INCREASING INPUT STAGE CURRENT



OFFSET BALANCING



5.1 SO-8 package information

Figure 2. SO-8 package outline

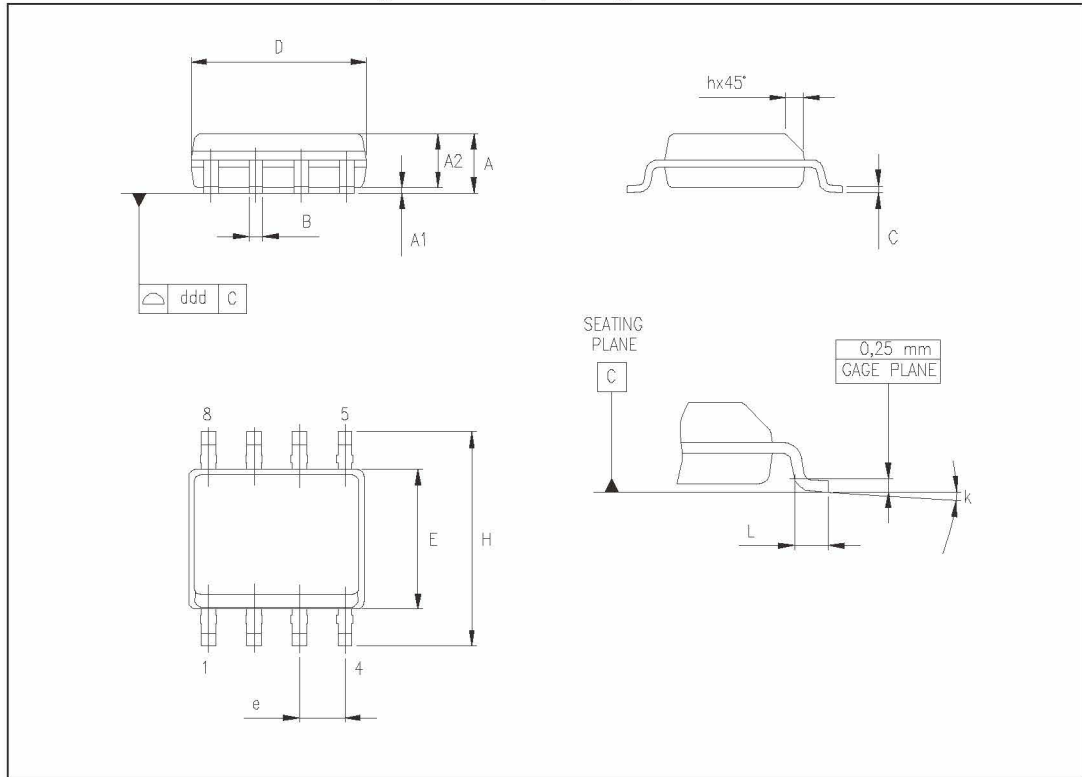


Table 5. SO-8 package mechanical data

Symbol	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.35	-	1.75	0.053	-	0.069
A1	0.10	-	0.25	0.004	-	0.010
A2	1.10	-	1.65	0.043	-	0.065
B	0.33	-	0.51	0.013	-	0.020
C	0.19	-	0.25	0.007	-	0.010
D	4.80	-	5.00	0.189	-	0.197
E	3.80	-	4.00	0.150	-	0.157
e	-	1.27	-	-	0.050	-
H	5.80	-	6.20	0.228	-	0.244
h	0.25	-	0.50	0.010	-	0.020
L	0.40	-	1.27	0.016	-	0.050
k	8° (max.)			8° (max.)		
ddd	-	-	0.10	-	-	0.004