DESCRIPTION

The LM311DR-CN devices are single high-speed voltage comparators . These device are designed to operate from a wide range of power supply voltages, including ±15V supplies for operational amplifiers and 5V supplies for logic systems.The output levels are compatible with most TTL and MOS circuits. These comparators arecapable of driving lamps or relays and switching voltages up to 40V at 50mA. All inputs and outputs can be isolated from system ground.The outputs can drive loads referenced to ground,V_{CC}+ or V_{CC}−. Offset balancing and strobe capabilities are available, and the outputs can be wire-OR connected. If the strobe is low, the output is in the off state, regardless of the differential input.

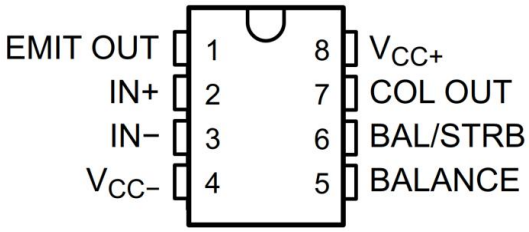
FEATURES

- Fast Response Time: 165ns
- Strobe Capability
- Maximum Input Bias Current: 300nA
- Maximum Input Offset Current: 70nA
- Can Operate From Single 5V 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

Pin Configuration



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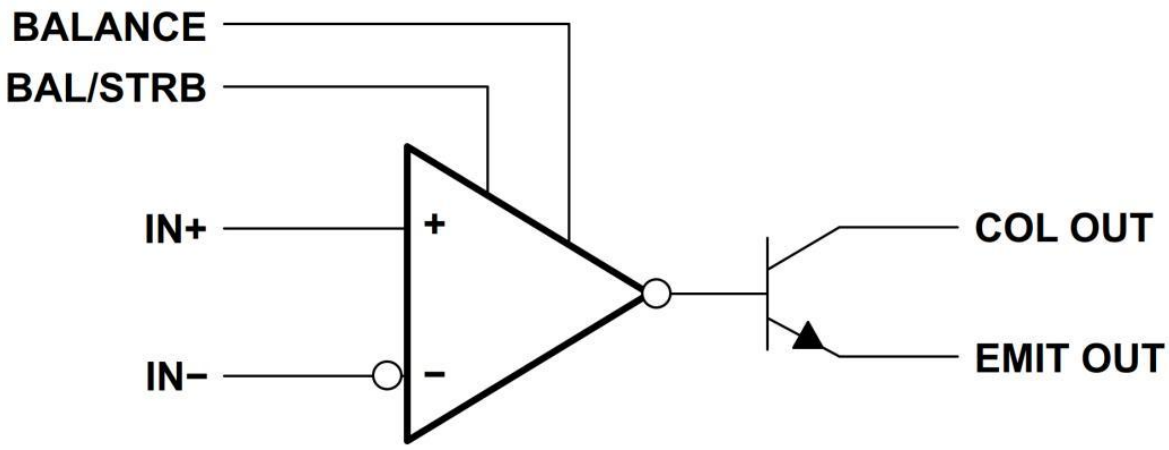
Simplified Schematic



Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	MAX	UNIT
Supply voltage	Signal-supply		36	V
	Dual-supply		±18	V
Differential input voltage			±30	V
Input Voltage			±15	V
Voltage from emitter output to VCC–			30	V
Voltage from collector output to VCC–			40	V
Duration of output short circuit to ground			10	S
Maximum Junction Temperature			+150	℃
Storage Temperature Range		-65	+150	℃

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
Supply Voltage, Vs=(V+) - (V-)	Signal-supply	3.5		30	V
	Dual-supply	±1.75		±15	V
Operating Temperature Range		-20	+25	+85	℃

ELECTRICAL CHARACTERISTICS

At specified free-air temperature, V_{CC}±= ±15 V,V_{ID}= –10 mV, T_A=25℃ (unless otherwise noted)

Characteristic	SYMBOL	CONDITIONS	LM311			
			MIN	TYP	MAX	UNIT
Input offset voltage	V_{IO}	Note(1)		2	7.5	mV
Input offset current	I_{IO}	Note(1)		6	50	nA
Input bias current	I_{IB}	1V≤V_O≤14V		100	250	nA
Low-level strobe current(2)	$I_{IL(S)}$	V(strobe)=0.3V, V_{ID}≤–10mV		-3		mA
Common-mode input-voltage range(1)	V_{ICR}	Lower range		-14.7	-14.5	V
		Upper range	13	13.8		
Large-signal differential-voltage amplification	A_{VD}	5 V≤V_O≤35V, R_L=1kΩ	40	200		V/mV
High-level (collector) output leakage current	I_{OH}	V_{ID}= 5mV, V_{OH}=35V		0.2	50	nA
Low-level output voltage (collector to emitter)	V_{OL}	I_{OL}= 50 mA		0.75	1.5	V
		V_{CC}+=4.5V, V_{CC}–=0V, I_{OL}=8mA		0.23	0.4	

Supply current from VCC+ output low	I_{CC}+	V_{ID}= –10mV, No load		5.1	7.5	mA
Supply current from VCC– output high	I_{CC}–	V_{ID}=10mV, No load		-4.1	-5	mA

Note(1) The offset voltages and offset currents given are the maximum values required to drive the collector output up to 14V or down to 1V with a pullup resistor of 7.5kΩ to VCC+. These parameters actually define an error band and take into account the worst-case effects of voltage gain and input impedance.

Note(2) The strobe must not be shorted to ground; it must be current driven at –3mA to –5mA .

TYPICAL CHARACTERISTICS

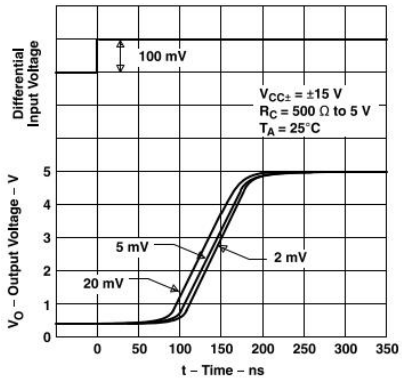


Figure 1. Output Response for Various Input Overdrives

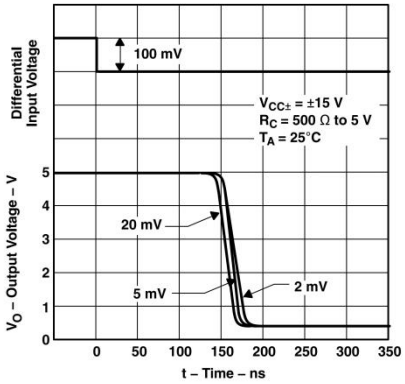


Figure 2. Output Response for Various Input Overdrives

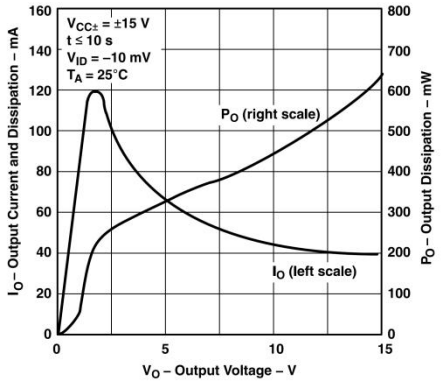


Figure 3. Output Current and Dissipation vs Output Voltage

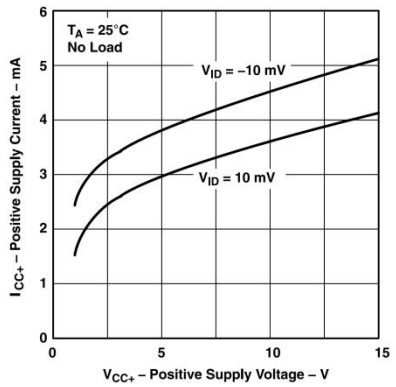


Figure 4. Positive Supply Current vs Positive Supply Voltage

Parameter Measurement Information

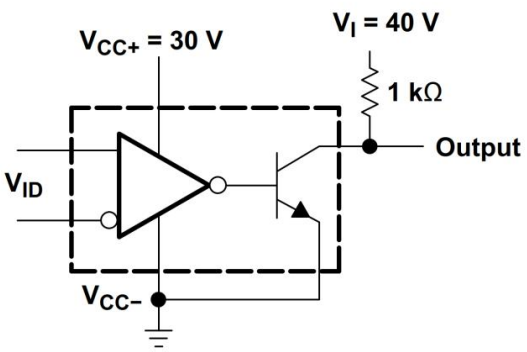


Figure 5. Collector Output Transfer Characteristic Test Circuit

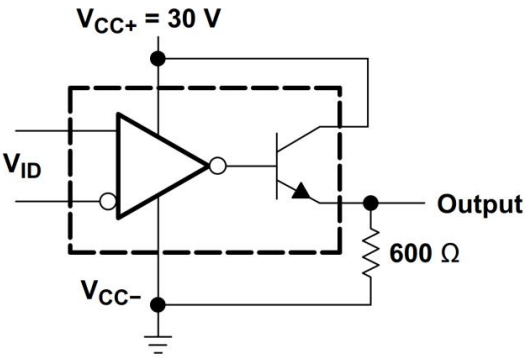


Figure 6. Emitter Output Transfer Characteristic Test Circuit

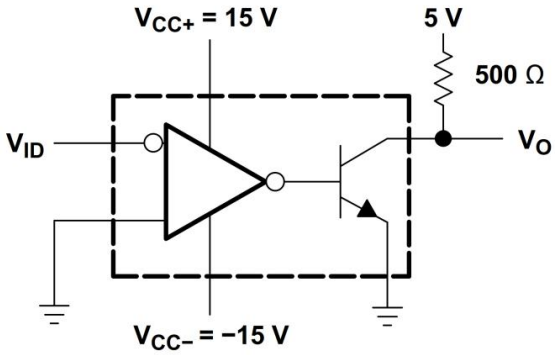


Figure 7. Test Circuit for Figure 1 and Figure 2

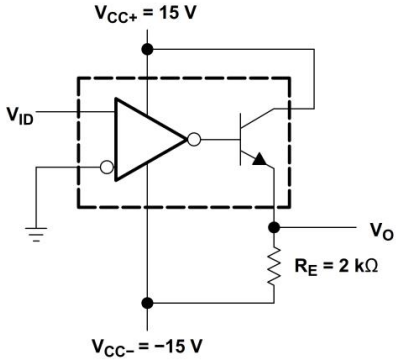


Figure 8. Test Circuit for Figure 10 and Figure 11

Typical Application

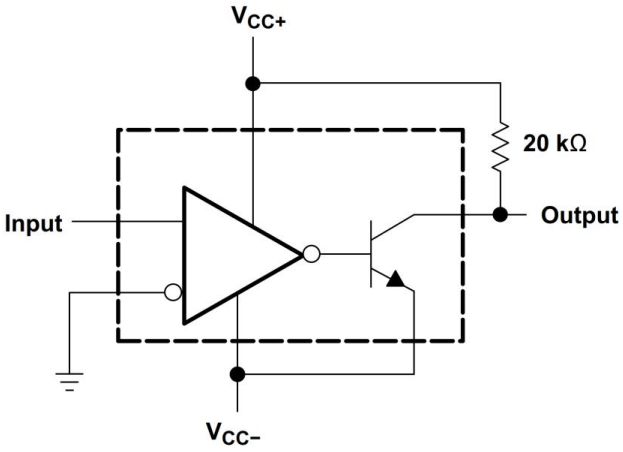


Figure 9. Zero-Crossing Detector

LAYOUT

Layout Guideline

To create an accurate comparator application without hysteresis, maintain a stable power supply with minimized noise and glitches, which can affect the high level input common-mode voltage range. To achieve this accuracy,add a bypass capacitor between the supply voltage and ground. Place a bypass capacitor on the positive power supply and negative supply (if available).

Layout Example

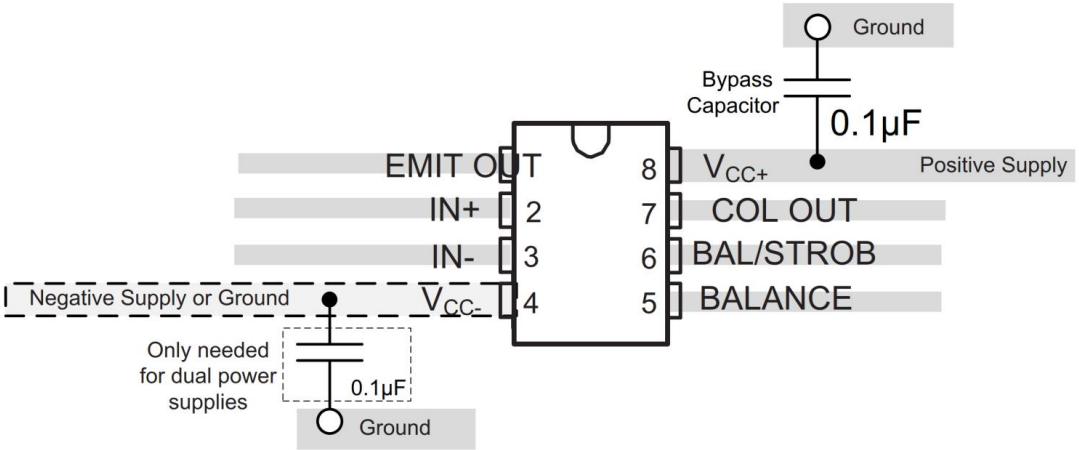


Figure10. LM311 Layout Example

PACKAGE OUTLINE DIMENSIONS

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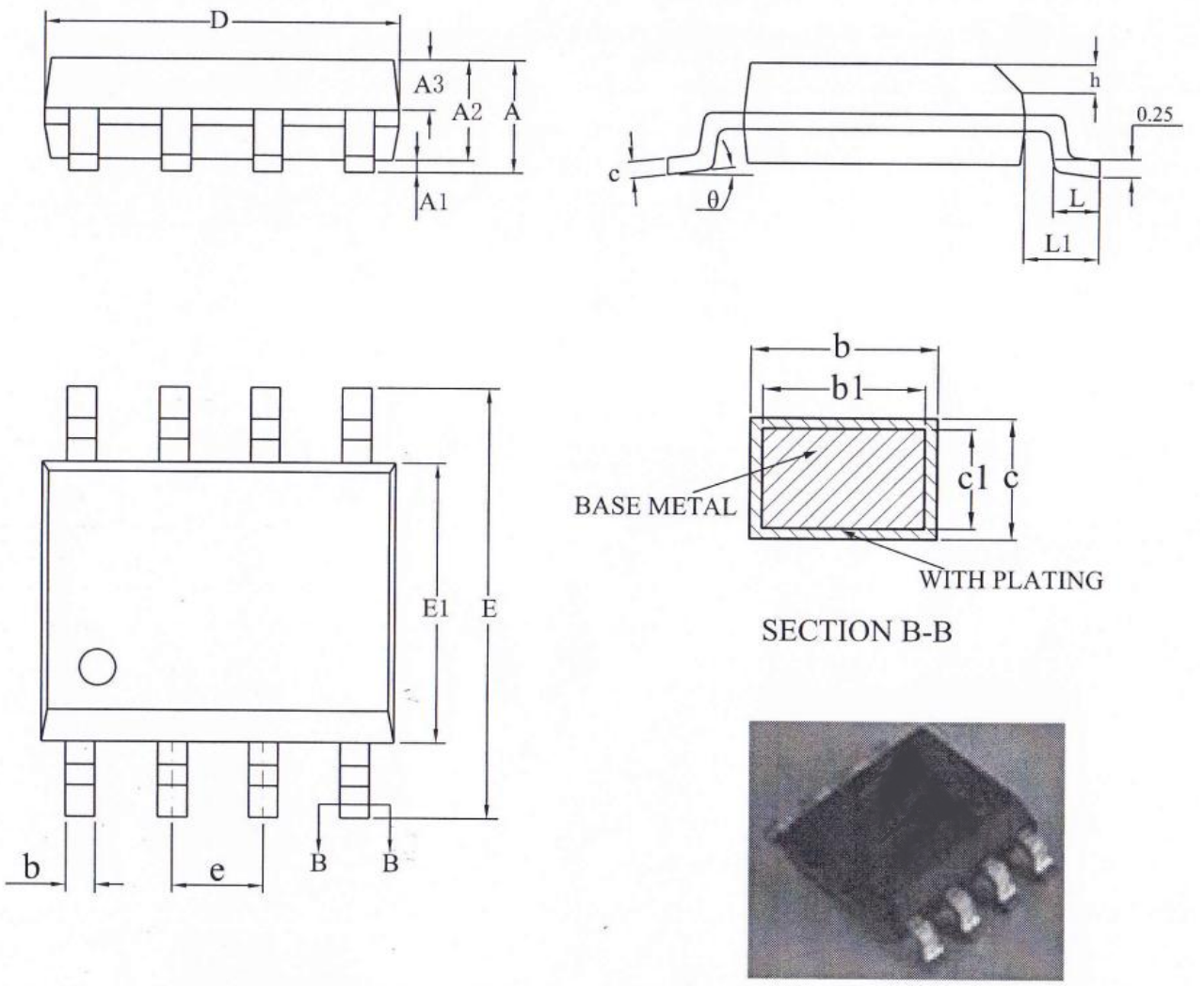

SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	-	-	1.75	D	4.80	4.90	5.00
A1	0.10	-	0.225	E	5.80	6.00	6.20
A2	1.30	1.40	1.50	E1	3.80	3.90	4.00
A3	0.60	0.65	0.70	e	1.27 BSC		
b	0.39	-	0.47	h	0.25	-	0.50
b1	0.38	0.41	0.44	L	0.50	-	0.80
c	0.20	-	0.24	L1	1.05REF		
c1	0.19	0.20	0.21	θ	0°	-	8°

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