EET-210L - Comparator Experiment using the LM34 & LM339.

1.) The LM339 is a Quad Comparator, having 4 different comparators on a single 14 pin chip. The LM34 is a precision temperature sensor whose output voltage is a linear 10 mV/ºF.

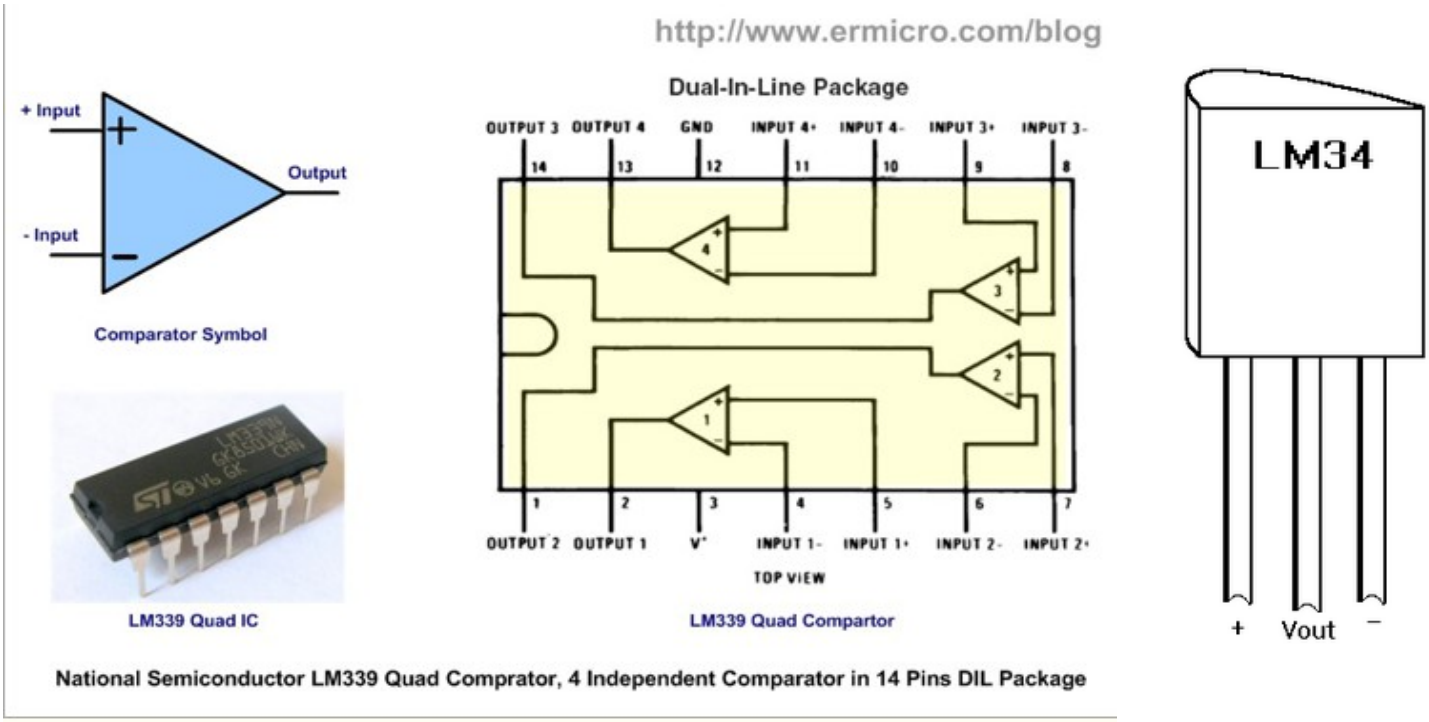


Fig. 1.

2.) Single comparator output circuit.

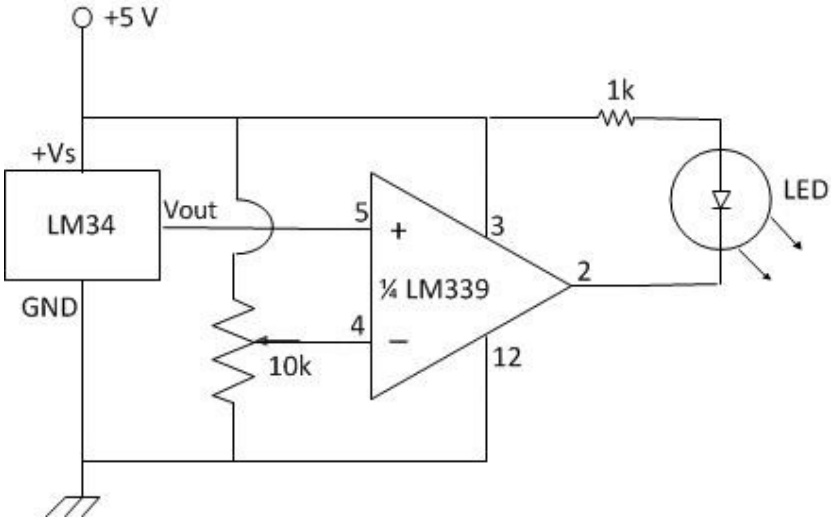


Fig. 2 Single Comparator circuit.

Adjust the 10k pot to create a reference voltage which corresponds to about 5 degrees above ambient room temperature on the (-) input of the comparator. In general, the output of the comparator circuit above will be as shown in the diagram on the next page. You should be able to get the comparator to detect the rise in temperature of the LM34 as you grasp it.

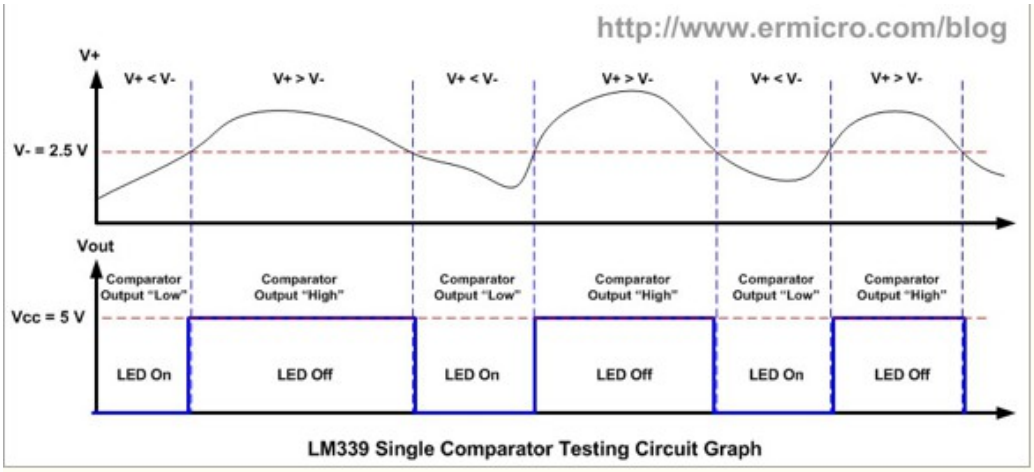
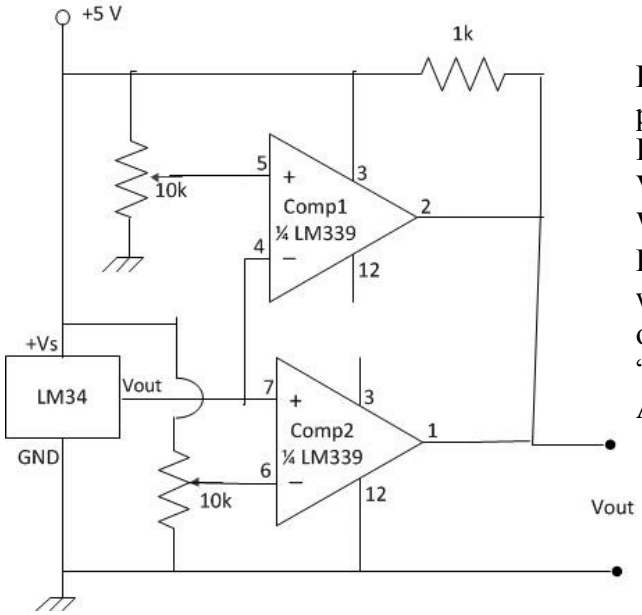


Fig. 3. Single Comparator Output

3.) Construct the Window Detector Circuit below.



HINT: When Vout of the LM34 is greater than the voltage on pin 5, Vout of (Comp1) and the Comparator circuit will be LOW. When Vout of the LM34 is less than voltage on pin 6, Vout of (Comp2) and the Comparator circuit will be LOW. When Vout of the LM34 is between the voltages on Pin 5 and Pin 6, Vout of (Comp1 & Comp2) and the Comparator circuit will be HIGH. In other words, when the open-collector outputs are tied together such as in this circuit, it creates a "wired-AND" function where the output can only be HIGH if ALL outputs are HIGH.

Fig. 4. Window Comparator Circuit

For this circuit, the output of the LM34 is connected to a Window Comparator Circuit. You must figure out how to add a Green LED to this circuit so that it will function as such: *When the temperature is between the two threshold voltages, the Green LED should light, indicating the temperature is within the acceptable range. If the temperature goes too high, or too low, the Green LED should go out, indicating the temperature is no longer within range.* **Make sure to edit your schematic diagram to show how you wired in your Green LED.** Set the upper reference voltage (V+ (pin 5) for Comp1) to a voltage equivalent to about 5 degrees above room temperature and the lower reference voltage (V- (pin 6) for Comp2) to a voltage equivalent to about 5 degrees below room temperature. When you have the circuit working properly, demonstrate its operation to your instructor.

Instructor initial _____

4.) Modify your circuit from step #3 so that a RED LED will be lit when the temperature is out of range and a GREEN LED will be lit when within the temperature window. Draw your schematic below. Show it to your instructor before constructing it. When you have arrived at a satisfactory solution, demonstrate the operation to your instructor.

Instructor initial _____

5.) Once you are sure your circuit works properly and have received your instructor's initials, remove the LM34 from the circuit in step #4 and replace it with a 10 Hz triangle ramp signal. This signal must have the following characteristics:

a.) a center voltage equivalent to the output voltage of the LM 34 at ambient temperature: V_{ctr} = _____

b.) a peak positive voltage equal to the (ambient temperature + 15 degrees) voltage: V_{+peak} = _____

c.) a peak negative voltage equal to the (ambient temperature - 15 degrees) voltage: V_{-peak}=_____

NOTE: *If you study the specifications given above, the ramp signal will have a peak-to-peak swing equal to a 30 degree change in temperature, or a 300 mV output swing on the LM34. The ambient temperature will be simulated by adding a D.C. Offset to the triangle waveform. So you must also set the D.C. Offset of your signal to simulate the ambient temperature. For this exercise, you will want to use the accuracy of the waveform generator built into the Agilent oscilloscopes.*

Take a screen shot showing both the input signal and the output signal of the comparator signals. If you still have the LED's connected, you should see them flash as the ramp signal voltage passes in and out of the window detection voltage. **Your screen shot should be labelled with your name and show the measurements of the following:**

a.) Frequency of the Input
b.) +Peak of the Input signal
c.) - Peak of the Input signal
d.) Peak-to-Peak voltage of the Output Signal.

Post this screen shot on the Forums as part of your progress report under the week this lab was assigned.

6.) Put away all of your components and equipment in the proper place.

7.) Post your Progress Report in the proper area on the cset Forums.