Modified window comparator compensates for temperature

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A window comparator circuit, which detects signal voltages at two different levels by comparing them to fixed references, can be modified to compensate for temperature variations that otherwise can affect the trip points that define the window.

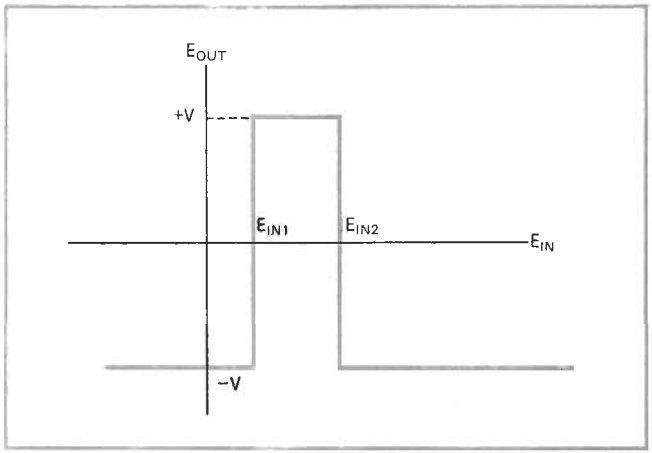
In the circuit's simplest configuration (Fig. 1), two voltage-reference dividers are connected to the inputs of an operational amplifier. Both dividers have the same excitation polarity, but the non-inverting input reference must be more positive than the inverting. Choosing the fractional resistance values establishes this inequality and defines the window's width.

An input signal is applied between diodes D_1 and D_2 from a low-impedance source, such as another op amp. For all signals that are at least one diode voltage drop more negative than the inverting input reference, diode D_2 is back-biased and not conducting, and the op amp is in negative saturation.

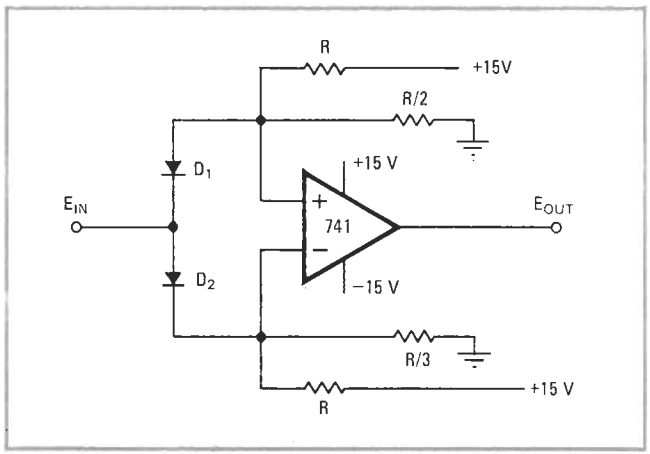
When the input signal is more than one diode drop more positive than the junction of the voltage divider at the inverting input, diode D_1 turns off and D_2 turns on. When the non-inverting op amp input becomes slightly more positive than the inverting input, the amplifier switches to positive saturation. In Fig. 2 this level is called E_{in1}.

A still larger positive excursion of the signal, to E_{in2} in Fig. 2, pulls the inverting input above the non-inverting one, making the op amp switch back again to negative saturation.

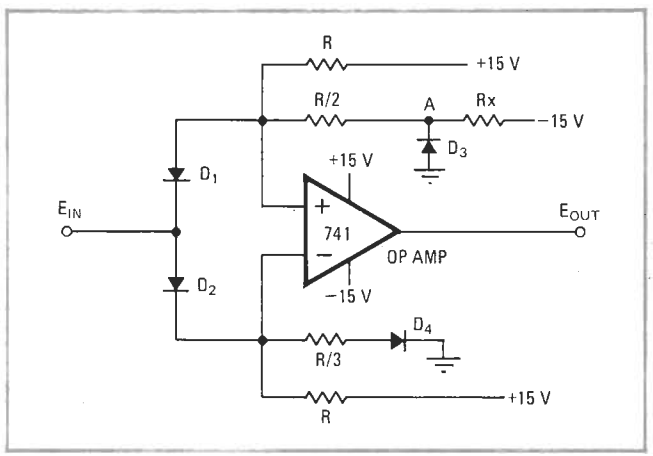
The two voltage references can be made negative by reversing the polarity of the excitation voltages and the input diodes. Doing this also reverses output polarity—it effectively turns Fig. 2 upside down. The reference volt-



2. Switching points. Op amp output is positive whenever input lies between E_{in1} and E_{in2}, negative for other levels.



1. Plain window. Operational amplifier, otherwise in positive saturation, is in negative saturation whenever input signal is more than 0.6 volt below negative reference or above positive reference.



3. Modified window. Because temperature changes can vary diode characteristics and change trip points, extra diodes in dividers vary in the same way and minimize the extent of the change.