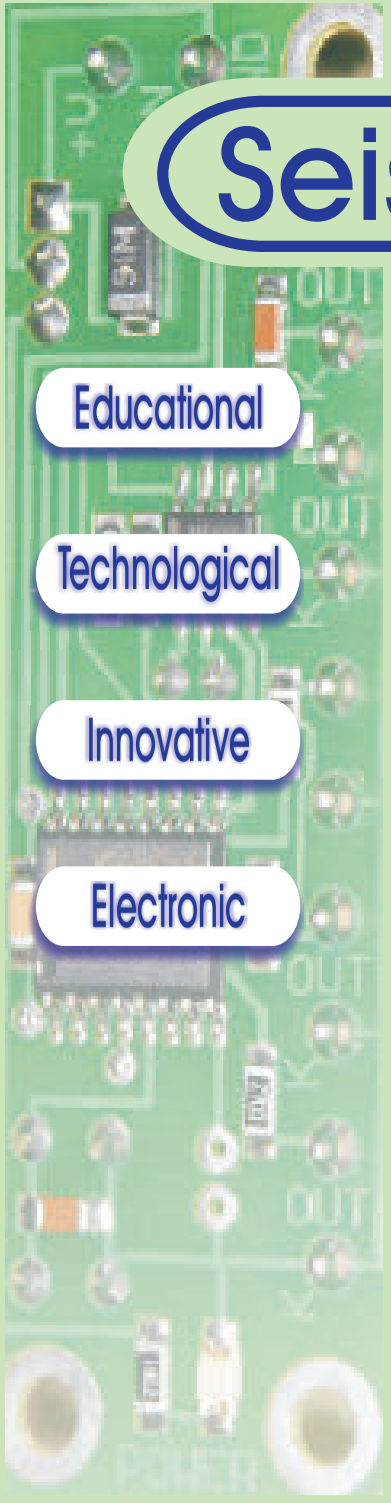

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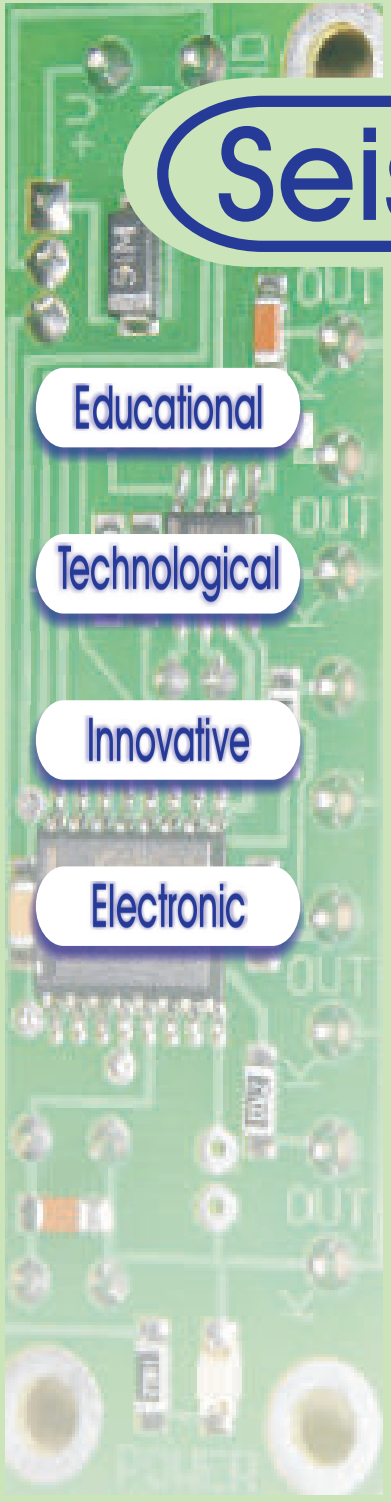
LDR CALCULATION

LDR Voltage Divider Calculation



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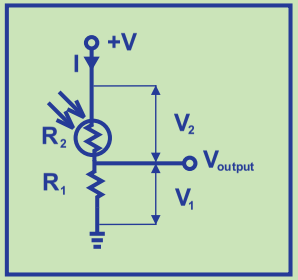
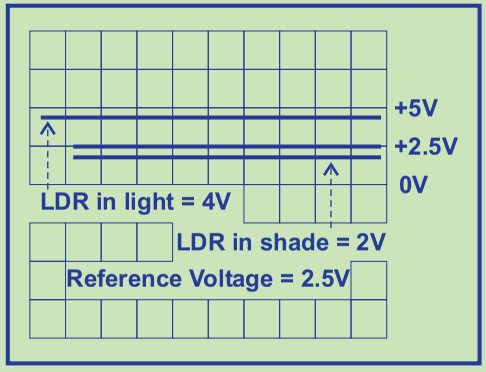
LDR CALCULATION

Calculate V_{output} with the LDR connected to +V.

Description	Formula	Diagram
The voltage applied to the LDR circuit is +5V. A reference voltage of 2.5V is created by two resistors in series that form a voltage divider network of 10K ohm each. The resistance of the LDR respond linearly to the amount of light falling on the brown S shape line. An increase in light mean a decrease in resistance. The resistance of the LDR is inversely proportional to the intensity of light. In other words the LDR has a negative co-efficient. LDRs functioning in reverse (positive co-efficient) also exist. First measure the resistance value of the LDR in the shade and again in light and note the readings. Use these readings in the formula calculations.	$V_{1\ Light} = \left(\frac{R_1}{R_1 + R_2}\right) \times V$ $= \left(\frac{22K}{22K + 5K7}\right) \times 5V$ $= \left(\frac{22K}{27K7}\right) \times 5V$ $= \left(0.7942\right) \times 5V$ $V_{1\ Light} = 3.971V$ $V_{1\ Shade} = \left(\frac{R_1}{R_1 + R_2}\right) \times V$ $= \left(\frac{22K}{22K + 35K}\right) \times 5V$ $= \left(\frac{22K}{57K}\right) \times 5V$ $= \left(0.3859\right) \times 5V$ $V_{1\ Shade} = 1.929V$	 **Oscilloscope** 

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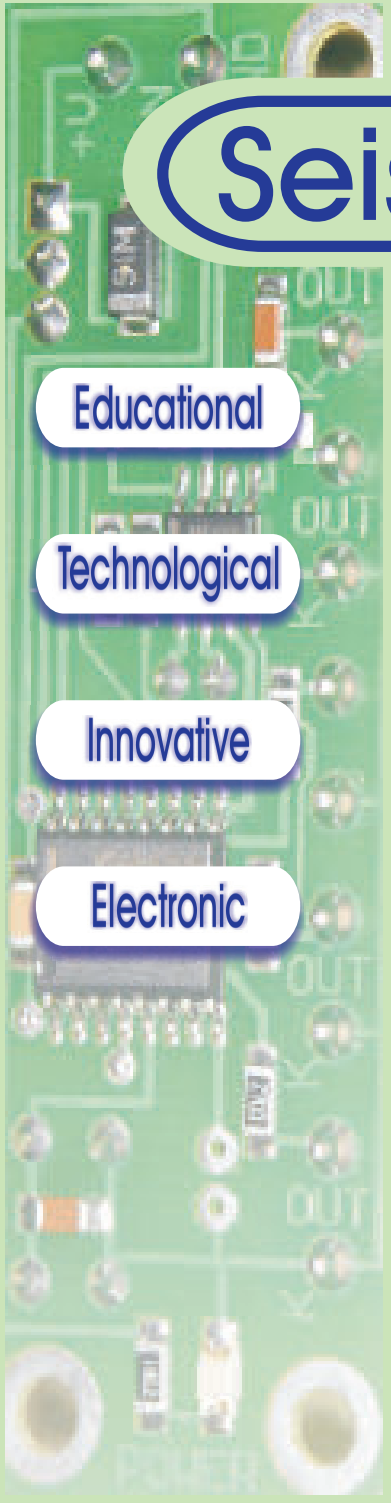

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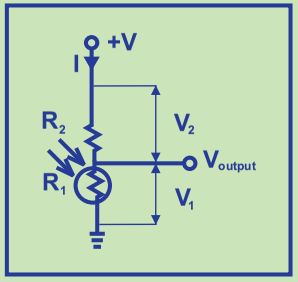
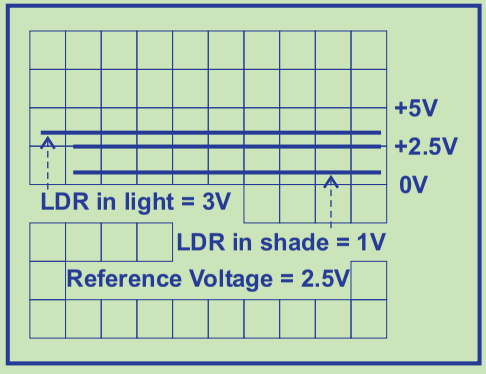
LDR CALCULATION

Calculate V_{output} with the LDR connected to 0V.

Description	Formula	Diagram
The voltage divider network function the same in reverse when the LDR is connected to 0V in comparison with, when the LDR is connected to +5V. With the LDR connected to 0V instead of +5V a LOW exist at V_{output} in light (1V) and a HIGH exist when the LDR is in shade (3V). The LDR now function as a dark sensor and not as a light sensor. The same diagram may be connected to a 9V supply.	$V_{1\ Light} = \left(\frac{R_1}{R_1 + R_2}\right) \times V$ $= \left(\frac{5K7}{5K7 + 22K}\right) \times 5V$ $= \left(\frac{5K7}{27K7}\right) \times 5V$ $= \left(0.2057\right) \times 5V$ $V_{1\ Light} = 1.028V$ $V_{1\ Shade} = \left(\frac{R_1}{R_1 + R_2}\right) \times V$ $= \left(\frac{35K}{35K + 22K}\right) \times 5V$ $= \left(\frac{35K}{57K}\right) \times 5V$ $= \left(0.6140\right) \times 5V$ $V_{1\ Shade} = 3.070V$	 **Oscilloscope** 

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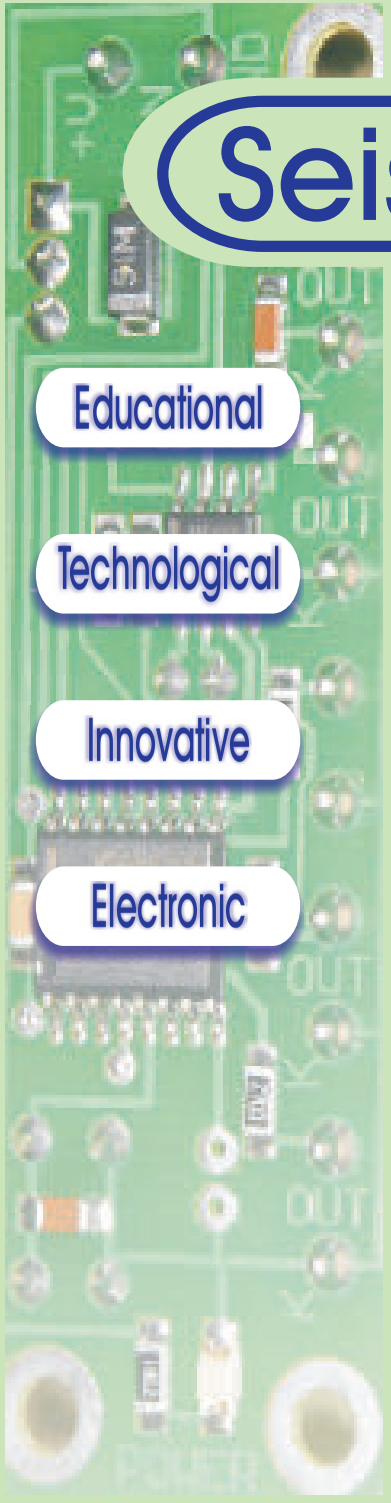

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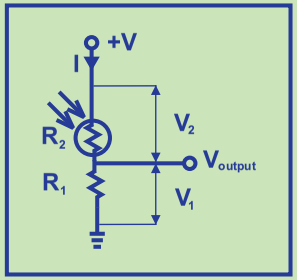
LDR CALCULATION

Comparisons in fixed resistor R_1 and the change in V_{output} .

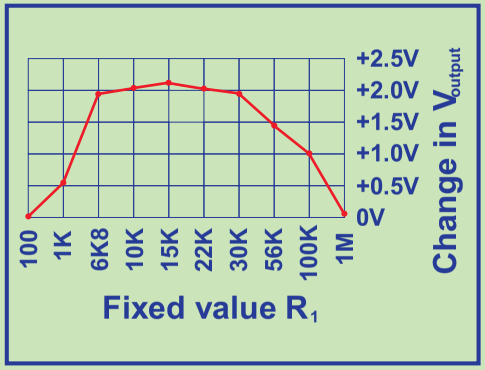
Start with a value of 15K for R_1. By using the voltage divider formula, substitute 15K for R_1 and calculate V_{output} when the LDR is in light and shade. Use the resistance value that was measured for the LDR in light and shade. The LDR is R_2. Subtract $V_{1\ Shade}$ from $V_{1\ Light}$ to find the change in V_{output} (2.123V). Divide the change in V_{output} by two. Add this new value to $V_{1\ Shade}$ (2.56V) and subtract this new value from $V_{1\ Light}$ (2.56V). This show that by using 15K for R_1, V_{output} will swivel very near proportional around the reference voltage of 2.5V when the LDR is in light and shade respectively.

Fixed value R_1	$V_{1\ Light}$	$V_{1\ Shade}$	Change in V_{output}
100	0.086	0.014	0.071
1K	0.746	0.138	0.607
6K8	2.72	0.813	1.906
10K	3.184	1.111	2.073
15K	3.623	1.5	2.123
22K	3.971	1.929	2.042
30K	4.201	2.307	1.893
56K	4.53	3.076	1.453
100K	4.73	3.703	1.026
1M	4.971	4.830	0.140

Diagram



Change in V_{output} Graph



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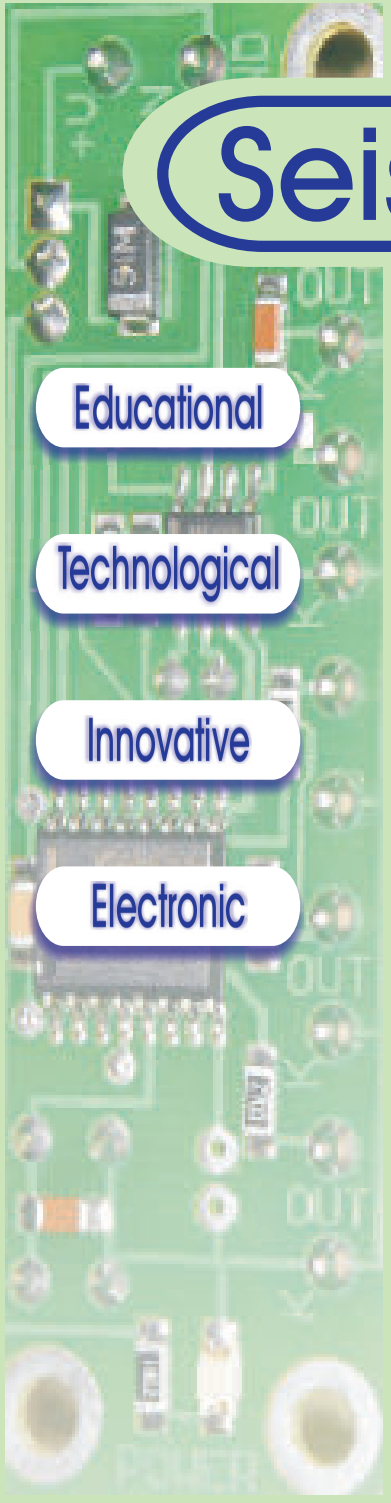

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