

EE236: Lab 10

Silicon Controlled Rectifier

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1 Aim of the experiment

1. To obtain the I-V characteristics of SCR.
2. To vary the gate currents and plot the I-V characteristics for different gate currents.
3. To control the phase angle of a sinusoidal signal using SCR.

2 Design & Working

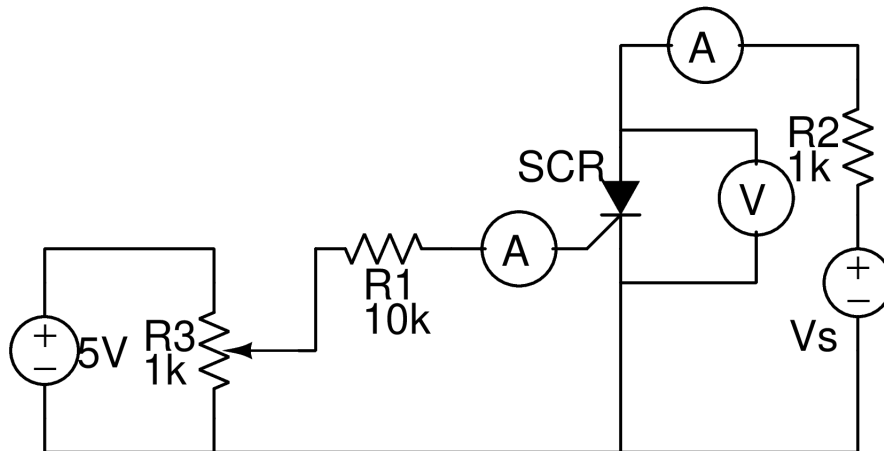


Fig. Circuit for SCR I-V characteristics

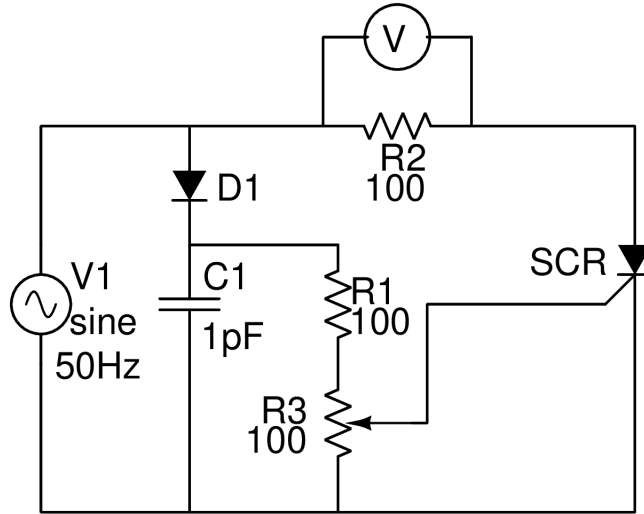


Fig. Phase control using SCR

3 Experimental Results

When the gate current is zero, increasing the anode voltage to maximum value does not turn the SCR on. This state of the SCR is called the forward blocking mode. But when we increase the gate current to say $1\mu A$ and then fix the anode voltage to $10V$, we observe a sudden drop in the voltage of the SCR to about $0.72V$. This mode is called the forward conducting mode.

Given below are my readings for I_{ak} and V_{ak} by varying V_{supply}

V_{supply}	$I_G = 1\mu A$		$I_G = 4\mu A$	
	V_{ak}	I_{ak}	V_{ak}	I_{ak}
10	9.19E-03	7.39E-01	9.21E-03	7.39E-01
10.5	9.50E-03	7.41E-01	9.69E-03	7.41E-01
11	1.01E-02	7.44E-01	1.02E-02	7.44E-01
11.5	1.06E-02	7.46E-01	1.07E-02	7.47E-01
12	1.11E-02	7.48E-01	1.12E-02	7.49E-01
12.5	1.16E-02	7.51E-01	1.17E-02	7.51E-01
13	1.21E-02	7.53E-01	1.22E-02	7.53E-01
13.5	1.26E-02	7.55E-01	1.27E-02	7.55E-01
14	1.31E-02	7.57E-01	1.32E-02	7.57E-01
14.5	1.36E-02	7.58E-01	1.37E-02	7.59E-01
15	1.41E-02	7.61E-01	1.42E-02	7.61E-01
15.5	1.46E-02	7.62E-01	1.47E-02	7.63E-01
16	1.51E-02	7.64E-01	1.52E-02	7.65E-01
16.5	1.56E-02	7.66E-01	1.57E-02	7.66E-01
17	1.61E-02	7.67E-01	1.62E-02	7.68E-01
17.5	1.66E-02	7.69E-01	1.67E-02	7.69E-01
18	1.71E-02	7.71E-01	1.72E-02	7.71E-01
18.5	1.76E-02	7.72E-01	1.77E-02	7.73E-01
19	1.81E-02	7.74E-01	1.83E-02	7.74E-01
19.5	1.86E-02	7.75E-01	1.88E-02	7.76E-01
20	1.91E-02	7.77E-01	1.93E-02	7.77E-01

V_{supply}	$I_G = 7\mu A$		$I_G = 10\mu A$	
	V_{ak}	I_{ak}	V_{ak}	I_{ak}
10	9.16E-03	7.39E-01	9.18E-03	7.39E-01
10.5	9.66E-03	7.41E-01	9.69E-03	7.42E-01
11	1.02E-02	7.44E-01	1.02E-02	7.44E-01
11.5	1.07E-02	7.47E-01	1.07E-02	7.47E-01
12	1.12E-02	7.49E-01	1.12E-02	7.49E-01
12.5	1.17E-02	7.51E-01	1.17E-02	7.51E-01
13	1.22E-02	7.53E-01	1.22E-02	7.54E-01
13.5	1.27E-02	7.55E-01	1.27E-02	7.56E-01
14	1.32E-02	7.57E-01	1.32E-02	7.58E-01
14.5	1.37E-02	7.59E-01	1.37E-02	7.60E-01
15	1.42E-02	7.61E-01	1.42E-02	7.61E-01
15.5	1.47E-02	7.63E-01	1.47E-02	7.63E-01
16	1.52E-02	7.65E-01	1.52E-02	7.65E-01
16.5	1.57E-02	7.67E-01	1.57E-02	7.67E-01
17	1.62E-02	7.68E-01	1.62E-02	7.68E-01
17.5	1.67E-02	7.70E-01	1.67E-02	7.70E-01
18	1.72E-02	7.71E-01	1.72E-02	7.71E-01
18.5	1.77E-02	7.73E-01	1.78E-02	7.73E-01
19	1.82E-02	7.74E-01	1.83E-02	7.75E-01
19.5	1.87E-02	7.75E-01	1.88E-02	7.76E-01
20	1.93E-02	7.77E-01	1.93E-02	7.77E-01

Given below is the plot for I_{ak} vs V_{ak} for different values of I_G

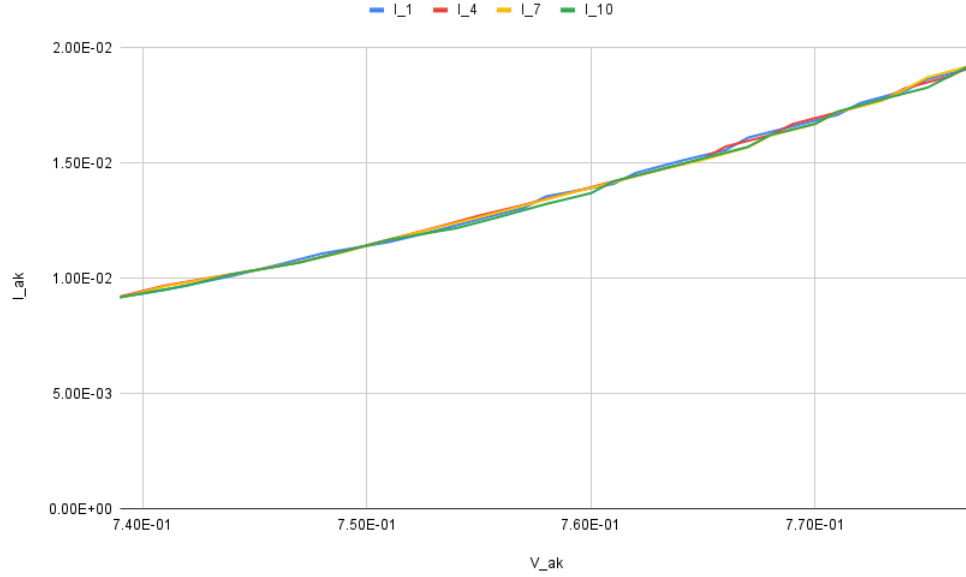


Fig. SCR I-V Characteristics for different I_G values

For the second part, by varying the potentiometer we can vary the gate voltage of the SCR. This enables us to control the phase upto 90 degrees. The output with the first extreme point of the potentiometer is shown in the first figure. We can observe that the diode almost completely blocks the input sine wave. As we rotate the potentiometer, at some point we observe some voltage across the resistor, as shown in the second figure. On further rotating in same direction, we observe that the width of the peaks increase, i.e. the phase increases, as shown in the third figure.

