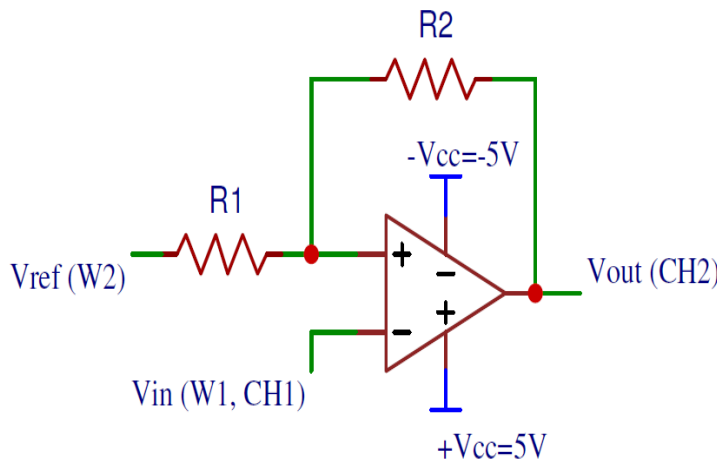


INVERTING SCHMITT TRIGGER

Objectives of the Experiment:

1. Use of Op-amp for designing circuit with 2 threshold voltages for switching the output voltage.
2. Understanding the importance of positive feedback and DC Reference voltage in deciding the threshold voltages.

INVERTING SCHMITT TRIGGER



Design equations:

By super position theorem,

$$V_{TH} = \frac{V_{SAT}R_1}{R_1+R_2} + \frac{V_{REF}R_2}{R_1+R_2}$$

$$V_{TH} = +V_{SAT}\beta + V_{REF}(1 - \beta)$$

$$V_{TL} = \frac{-V_{SAT}R_1}{R_1+R_2} + \frac{V_{REF}R_2}{R_1+R_2}$$

$$V_{TL} = -V_{SAT}\beta + V_{REF}(1 - \beta)$$

$$\beta = \frac{R_1}{R_1 + R_2}, \quad (1 - \beta) = \frac{R_2}{R_1 + R_2}$$

$$\text{Hysteresis voltage} = V_{TH} - V_{TL} =$$

$$V_{Hystereis} = \beta 2V_{SAT}$$

$$V_{TH} + V_{TL} = (1 - \beta) 2V_{REF}$$

Procedure for conduction:

1. Select the Inverting Schmitt Trigger through Op-amp, applications option.
2. Select one of the Inverting Schmitt Trigger option.
3. Click on conduction button.
4. Take screenshots as required.
5. Use cursors to measure the Slew rate.
6. Also obtain the Transfer characteristics using ADD XY in VIEW option of Scope.
7. Repeat the above steps with different VREF (DC voltage using W2).

Analog Discovery settings:

Wavegen		Scope:	
		Time: Position: 0s Base: 5ms/div	
Wavegen 1	Wavegen 2	Channel 1	Channel 2
Sine wave Amplitude: 5V Offset: 0V Frequency: 100Hz Duty cycle: 50%	DC: 0, 1,2, -1, -2 V	Offset: 0V	Offset: 0V
		Range: 1V/div	Range: 1V/div
		View-Measurements-Add	
		Vertical C1: Maximum, Minimum Horizontal: C1: Frequency	Vertical C2: Maximum, Minimum

				Calculated		Measured	
Expt.	$R_1(\Omega)$	$R_2(\Omega)$	$V_{REF}(V)$	$V_{TH}(V)$	$V_{TL}(V)$	$V_{TH}(V)$	$V_{TL}(V)$
INVST 1	1K	1K	0				
			+ve				
			-ve				
INVST 2	1K	10K	0				
			+ve				
			-ve				
INVST 3	10K	1K	0				
			+ve				
			-ve				
INVST 4	10K	10K	0				
			+ve				
			-ve				

Experiment Outcome: After conducting the experiment students are able to

1. Understand effect of positive feedback in Op-amp based circuits.
2. Know how to switch the output from +VSAT to –VSAT and vice versa.
3. Know the role of each component and reference voltage.
4. Design the Inverting Schmitt trigger for desired threshold voltages.
5. Provide solutions to real time challenges using Inverting Schmitt Trigger.