

SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution)

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COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Name: 23ECT203 LINEAR INTEGRATED CIRCUITS

II YEAR/VI SEMESTER

UNIT II –APPLICATIONS OF OPERATIONAL AMPLIFIERS

Topic :Clipper and Clamper in op amp

- ✓ Clips amplitude above/below reference level
- ✓ Removes portion of waveform
- ✓ Diode or op-amp based
- ✓ Positive, negative, and biased clippers

Waveform Shaping Circuit

Limits or cuts off part of signal

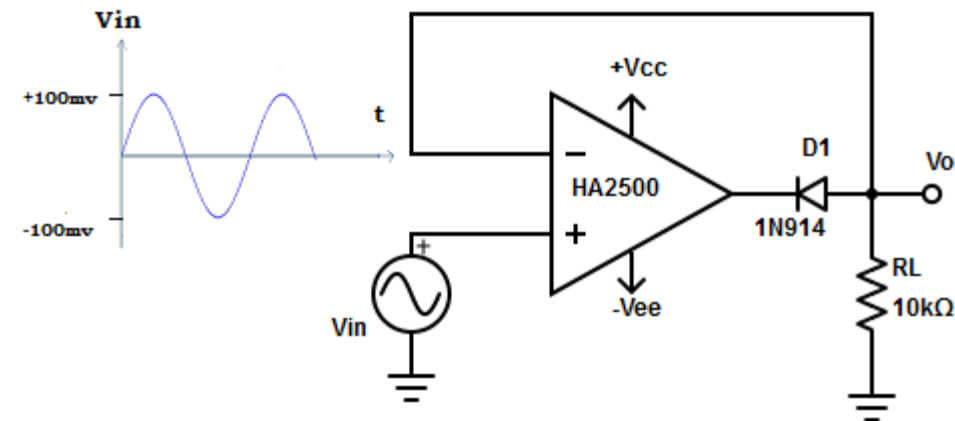
- ✓ Clips positive peaks above reference voltage
- ✓ Diode connected to clip positive portion
- ✓ Output: negative half-cycle preserved

Σ Clipping Condition

$$V_{in} > V_{ref}$$

Waveform

Positive half-cycle clipped, negative half-cycle unchanged



↓ Negative Clipper Circuit

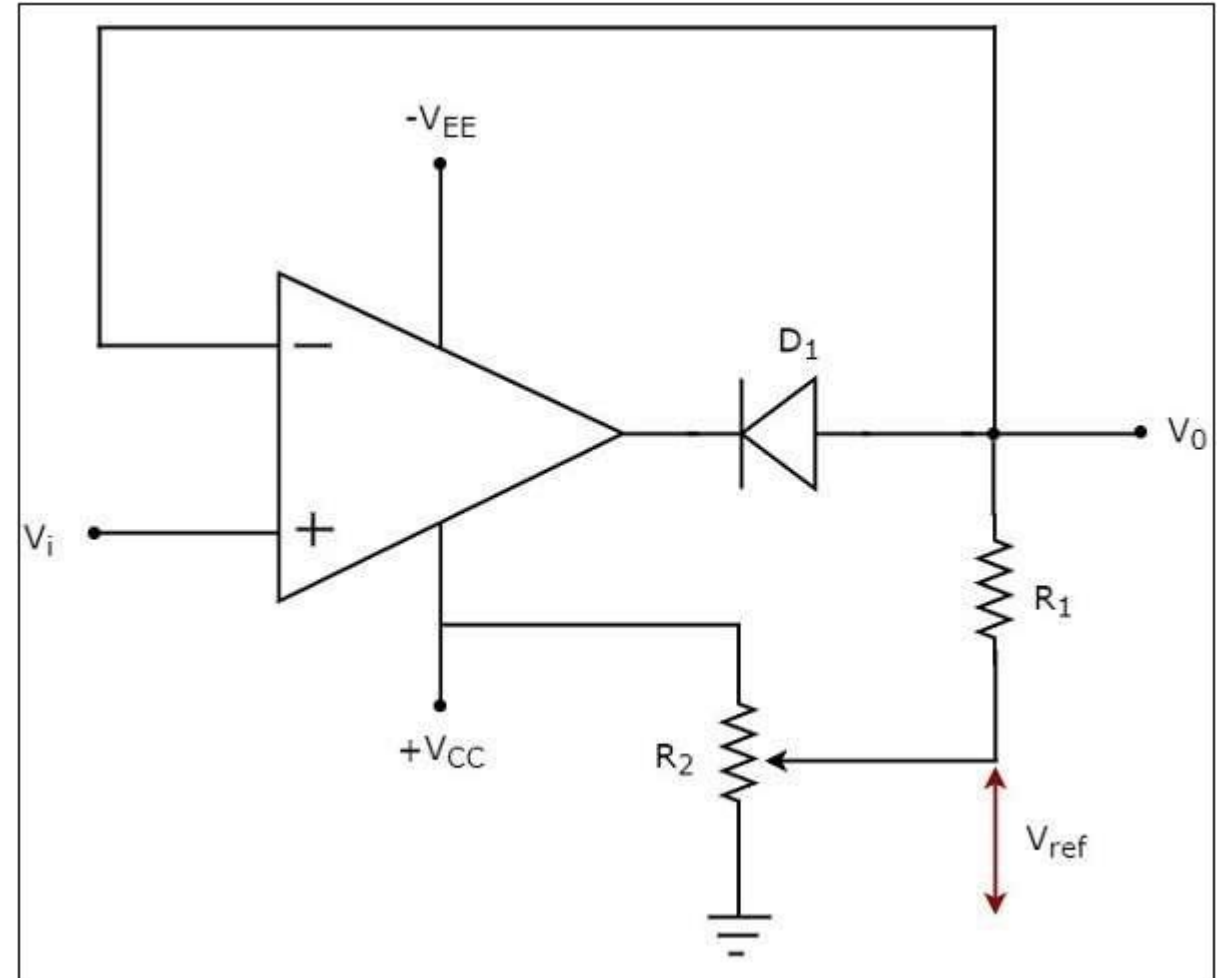
- ✓ Clips negative peaks below reference voltage
- ✓ Diode connected to clip negative portion
- ✓ Output: positive half-cycle preserved

Σ Clipping Condition

$$V_{in} < V_{ref}$$

Waveform

Negative half-cycle clipped, positive half-cycle unchanged





- ✓ Shifts DC level of AC signal
- ✓ Adds or removes DC component
- ✓ Capacitor used for level shifting
- ✓ Positive and negative clampers

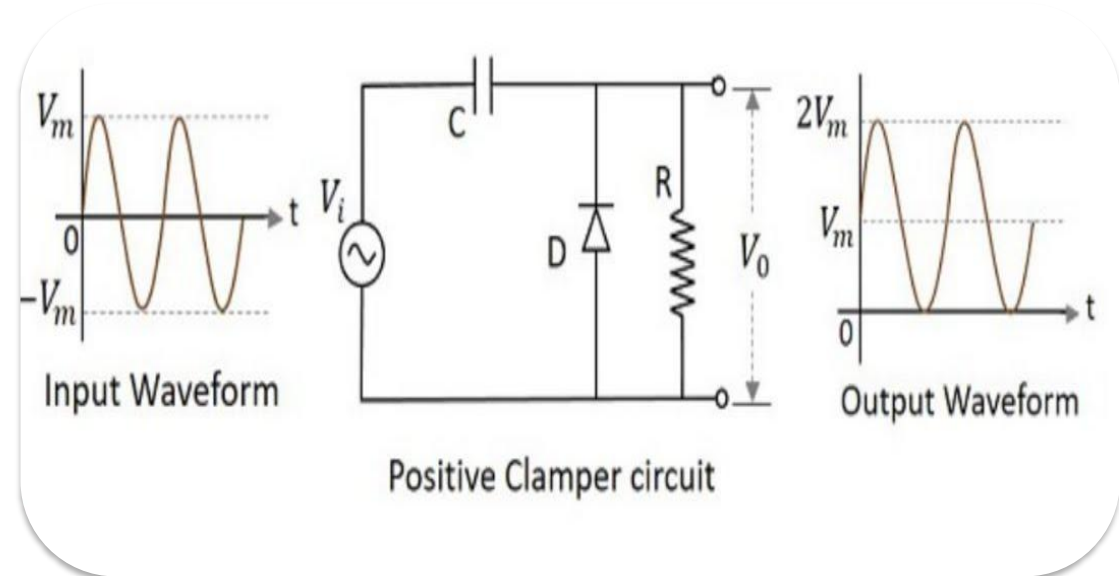
Key Difference

Clamper shifts DC level without changing waveform amplitude

- ✔ Shifts waveform up by DC voltage
- ✔ Capacitor stores charge during negative cycle
- ✔ Output peaks at $V_{in} + V_{DC}$
- ✔ Diode conducts during negative half-cycle

Waveform Shift

Entire waveform displaced upward by DC voltage level

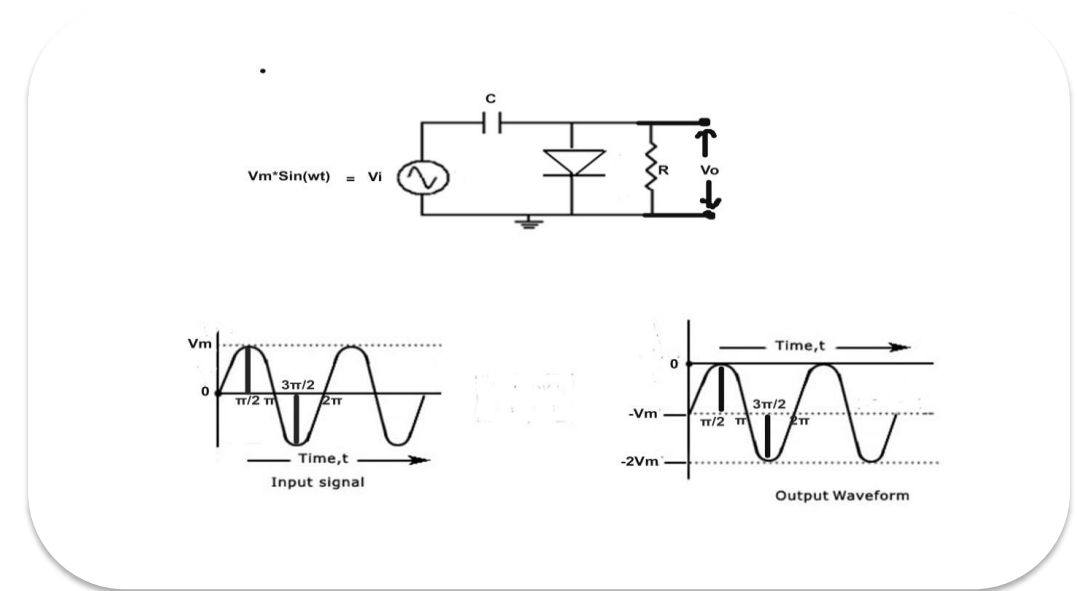


↓ Negative Clamper Circuit




- ✓ Shifts waveform down by DC voltage
- ✓ Capacitor stores charge during positive cycle
- ✓ Output peaks at $V_{in} - V_{DC}$
- ✓ Diode conducts during positive half-cycle

Waveform Shift




Entire waveform displaced downward by DC voltage level



Clipper

-  Removes portion of waveform
-  Changes amplitude
-  Uses diode clipping

Clamper

-  Shifts DC level of waveform
-  Maintains amplitude
-  Uses capacitor for level shift

Clipper Applications





- ✓ Signal rectification
- ✓ Amplitude limiting
- ✓ Noise suppression
- ✓ Waveform shaping

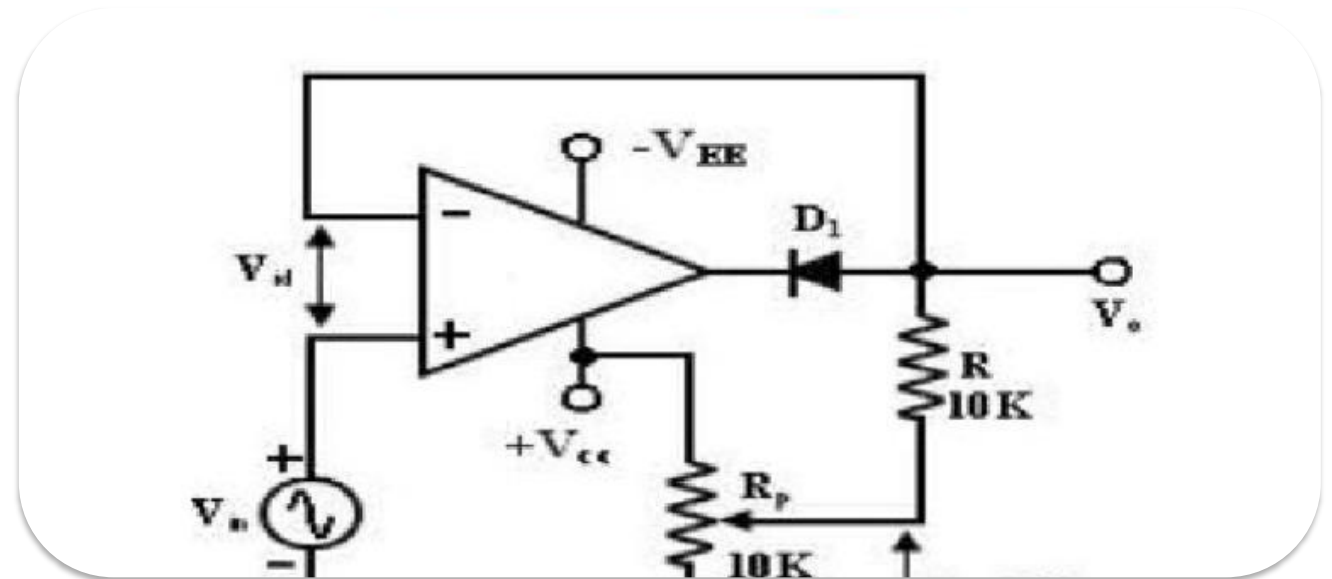
Clamper Applications

- ✓ DC restoration
- ✓ Level shifting
- ✓ AC coupling
- ✓ TV video processing



Stage 1: Empathize

-  Understanding student challenges in learning clipper and clamper circuits
-  Identifying conceptual difficulties
-  Recognizing practical implementation issues
-  Analyzing common mistakes in circuit design





Stage 3: Ideate



Brainstorming circuit configurations



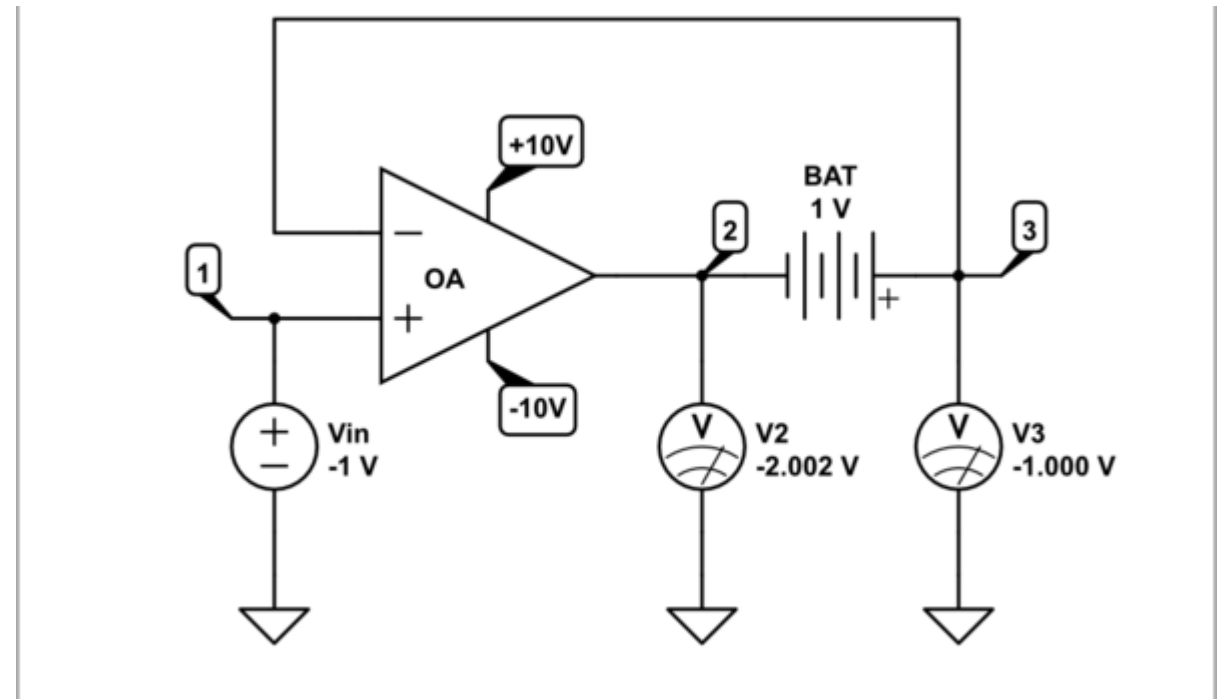
Analyzing op-amp applications



Exploring component combinations

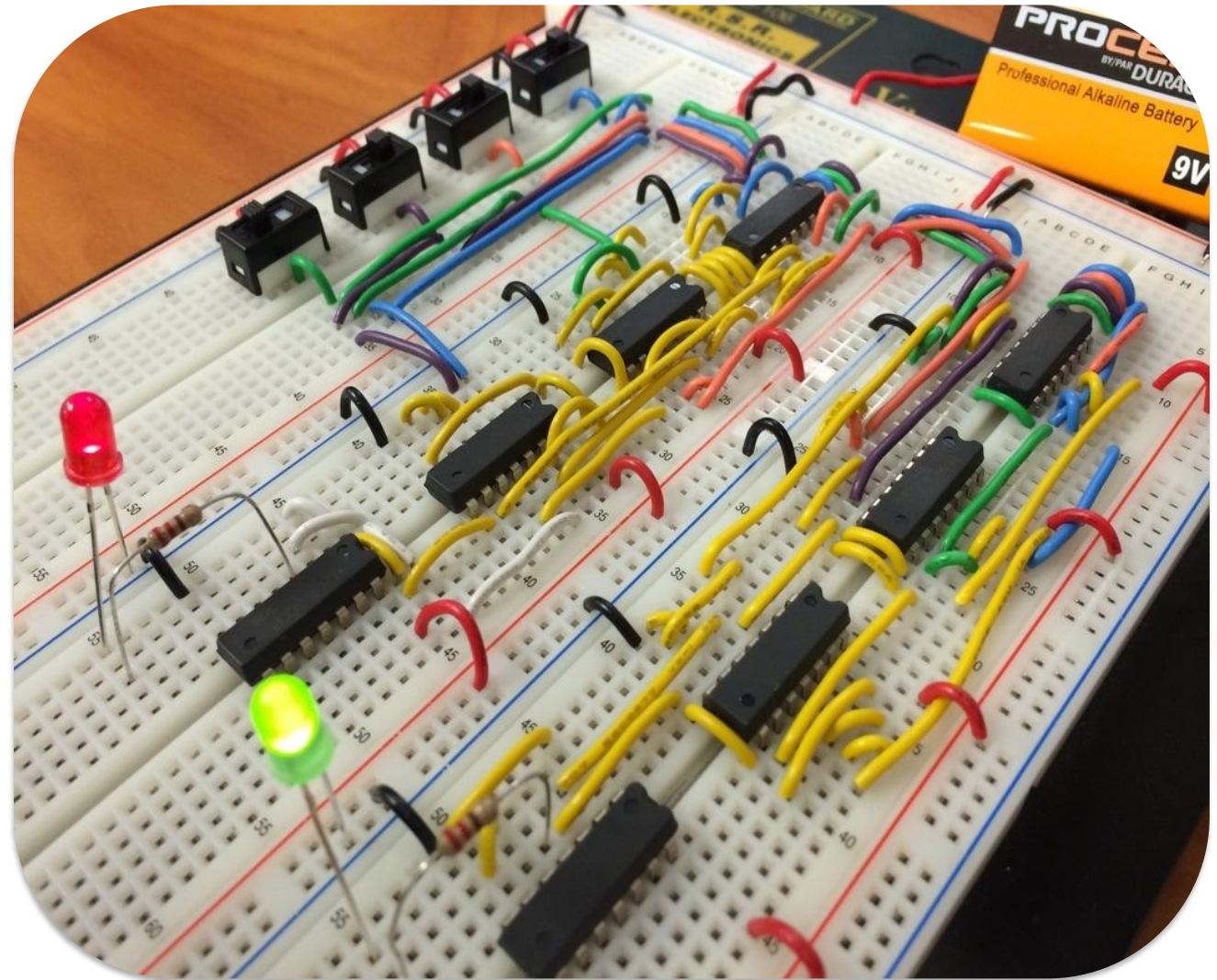


Developing systematic analysis approaches





Stage 4: Prototype



Building clipper circuit prototypes



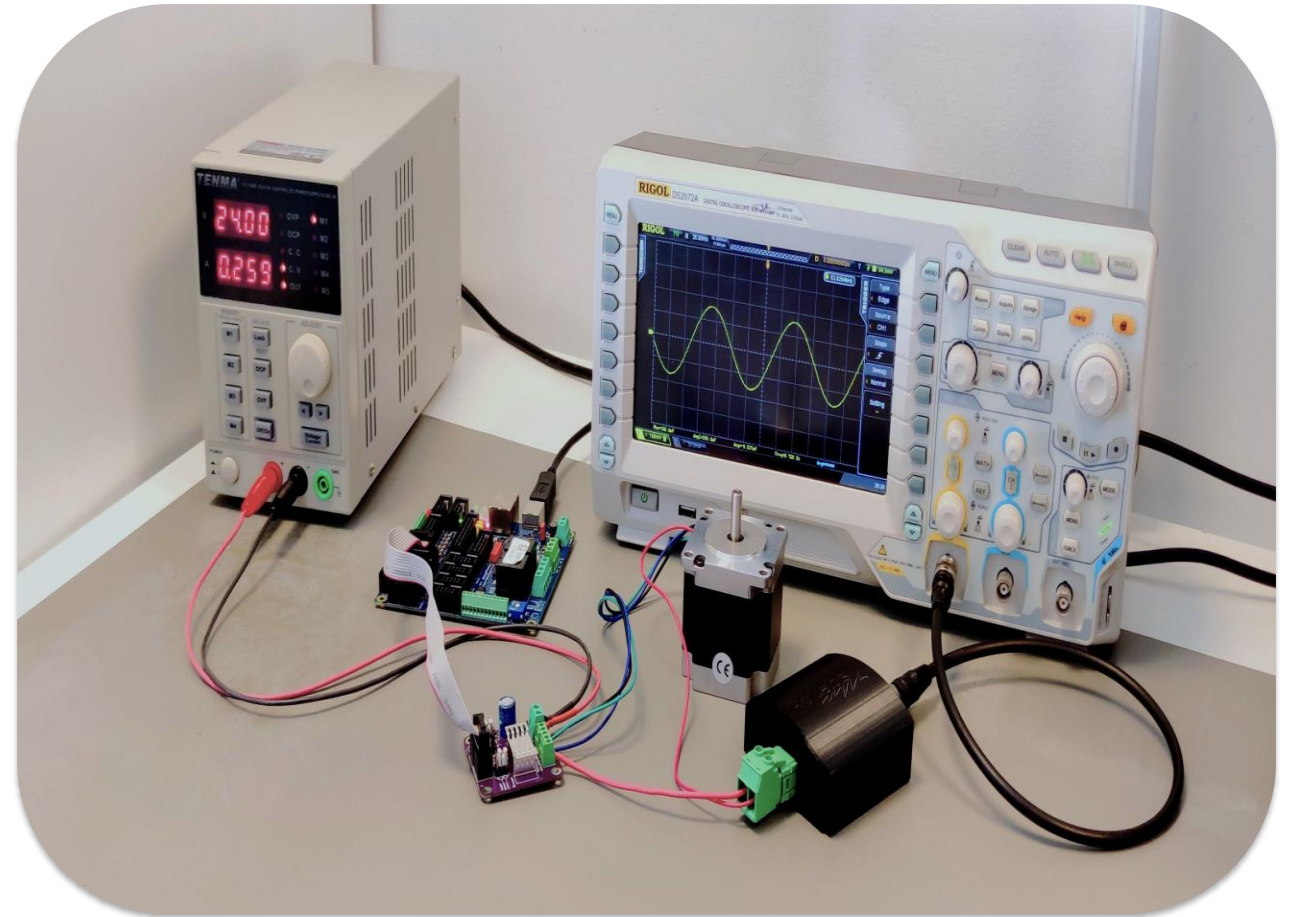
Building clamper circuit prototypes



Testing component values



Verifying circuit operation with oscilloscope



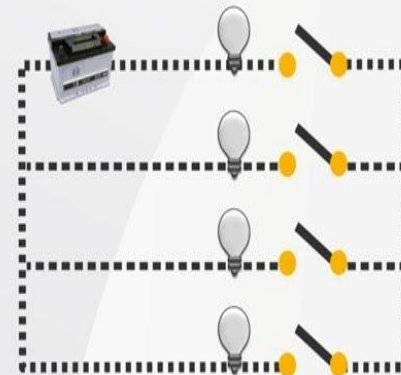
- ✓ Measuring input and output waveforms
- Verifying clipping levels
- ⚡ Checking DC shift amounts
- ⚙️ Validating circuit performance



Key Questions

- Q1: Explain positive clipper operation
- Q2: Derive clipping condition
- Q3: Applications in signal processing
- Q4: Explain DC level shift in clamper
- Q5: Calculate capacitor value

In the circuit shown, how many switches need to be closed to light up at least one bulb?



- A) None
- B) One
- C) Two
- D) Three



Textbooks





- Sergio Franco
Design with Operational Amplifiers and Analog Integrated Circuits
- D. Roy Choudhry & Shail Jain
Linear Integrated Circuits
- Ramakant A. Gayakwad
OP-AMP and Linear ICs

Online Resources

- 🌐 Texas Instruments Comparator Applications Handbook
- 🌐 Analog Devices Design Guides
- 🌐 Electronics Tutorials

Thank You

Clipper and Clamper in Op-Amp

-  Clipper circuits remove portions of waveforms
-  Clamper circuits shift DC levels
-  Both are essential for signal processing
-  Applications in electronics and communications