Measure Transistor Tracer Curves

- with Function Generators and Oscilloscope

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Function Generator: to stimulate and test circuits

It produces pre-defined electrical signals

- Common waveforms: sine, square, triangle
- Acts as a controllable voltage source

The front panel of a function generator in the lab

We have function generators in different shape and sizes

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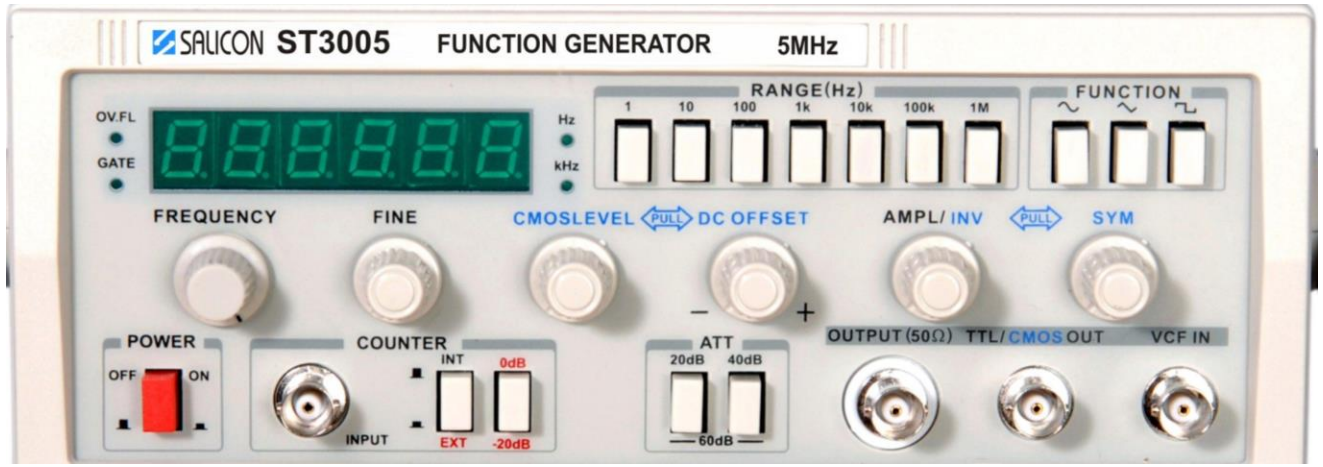
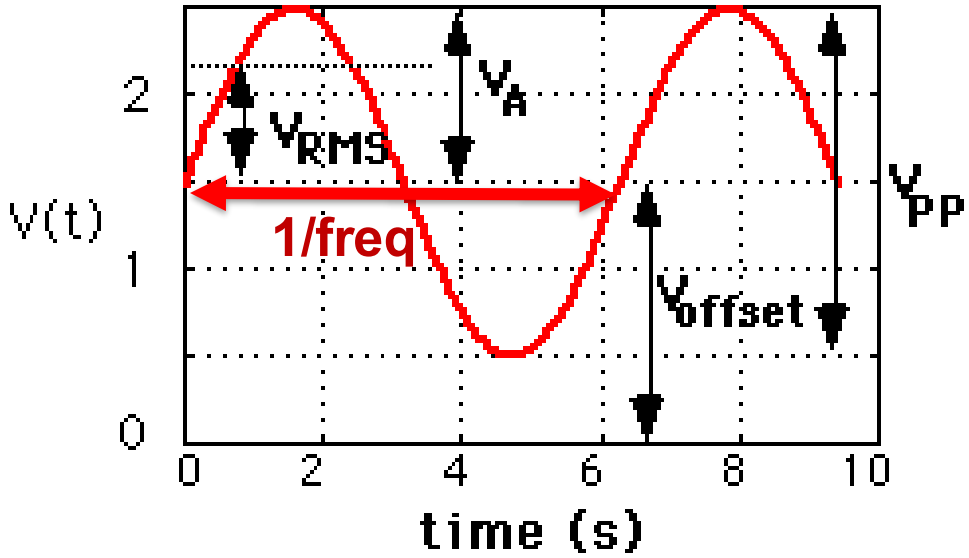
Basic Steps of Function Generator Controls

The front panel of a function generator in the lab



Representative signal showing Frequency, Vpp and Offset



https://www.hit.bme.hu/

Step 1: Power ON

Step 2: Chose the Waveform

Step 3: Adjust the output specs (you can do it live):

- Frequency controls how fast the signal repeats (Hz)
- Amplitude sets signal size (Vpp)
- DC offset shifts the signal up or down

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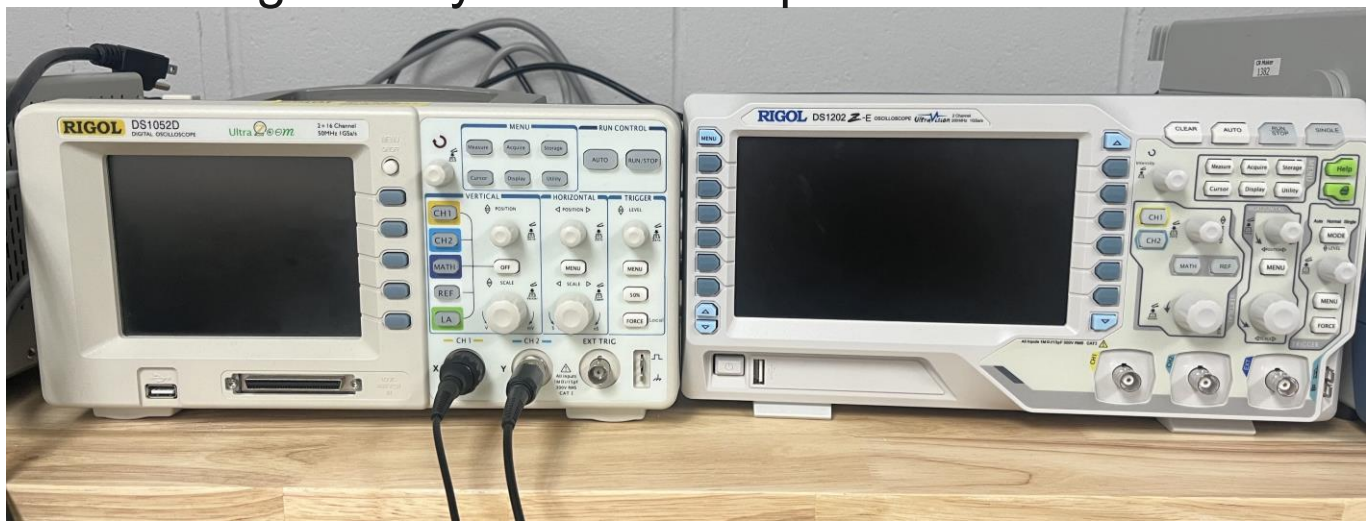
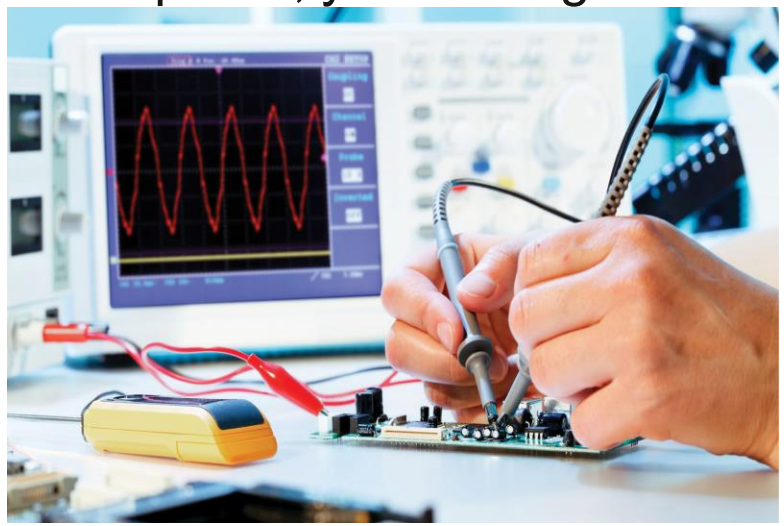
Oscilloscope: measures and display in real time

- Instrument that measures voltage versus time
  - Allows observation of waveform shape and timing
  - More informative than a multimeter for AC signals

We got many different scopes in the lab



You probe, you see signals



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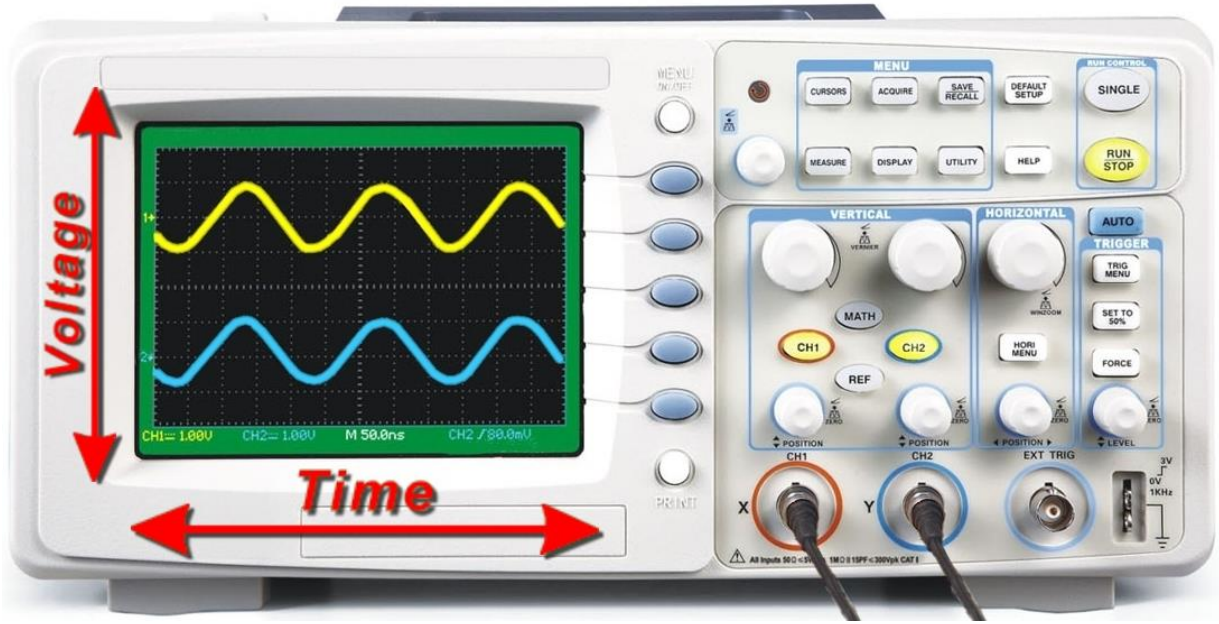
Oscilloscope Signal Basics

- Vertical axis represents voltage (V/div)
  - Horizontal axis represents time (s/div)
  - Each grid division is a unit of voltage or time
  - Multiple channels allow multiple inputs and signal comparison



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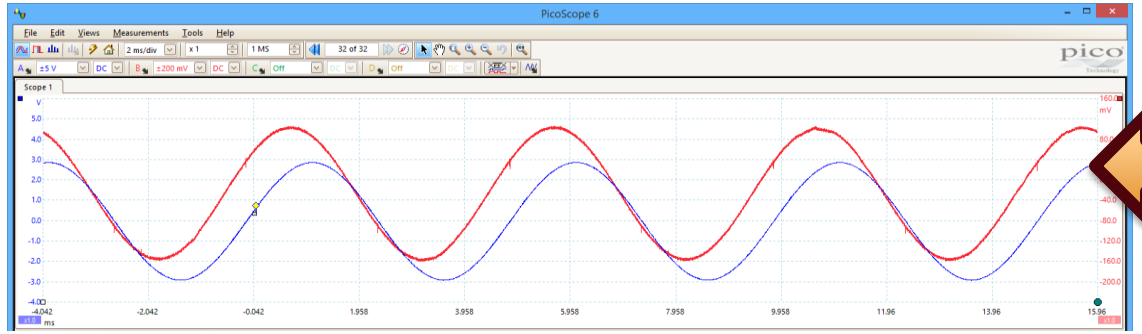
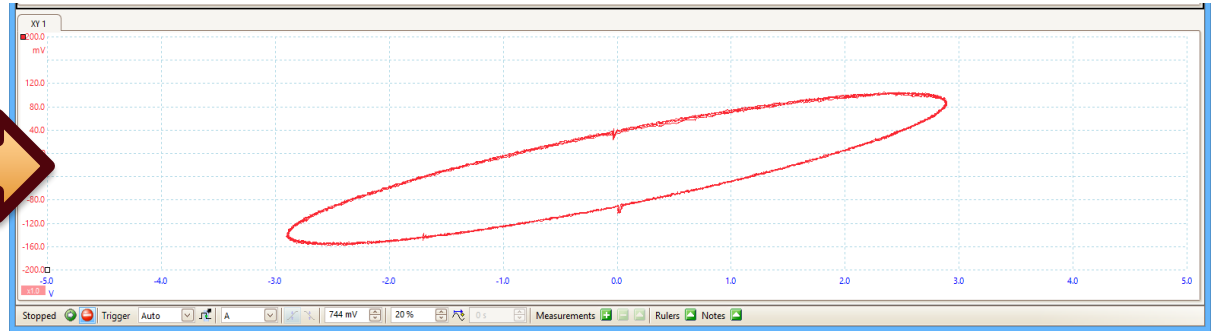
X–Y Mode

- Removes time from the display
  - Channel 1 controls the X-axis
  - Channel 2 controls the Y-axis
  - Used to plot one voltage versus another

Time series



X-Y mode



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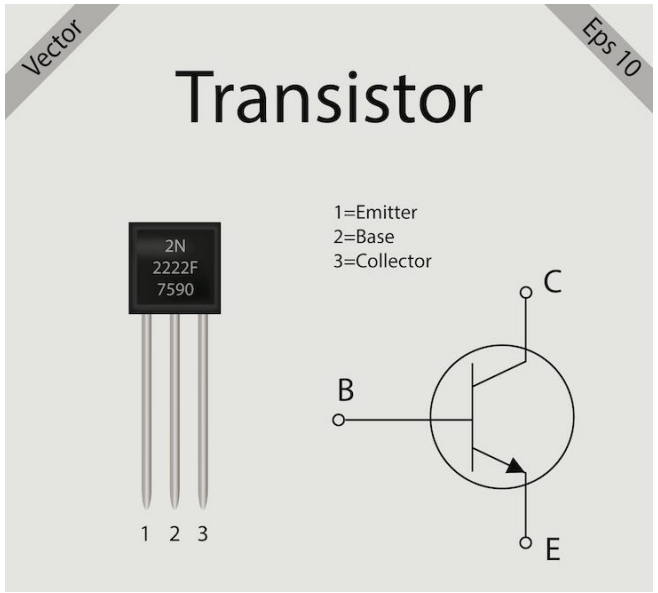
Transistor and Transistor Tracer Curves

- Plot of collector current (Ic) versus collector-emitter voltage (Vcb)
  - Each curve represents a different base current
  - Shows cutoff, active, and saturation regions
  - Provides visual understanding of transistor operation



What Is a Transistor? (Definition, How It Works, Example) | Built In

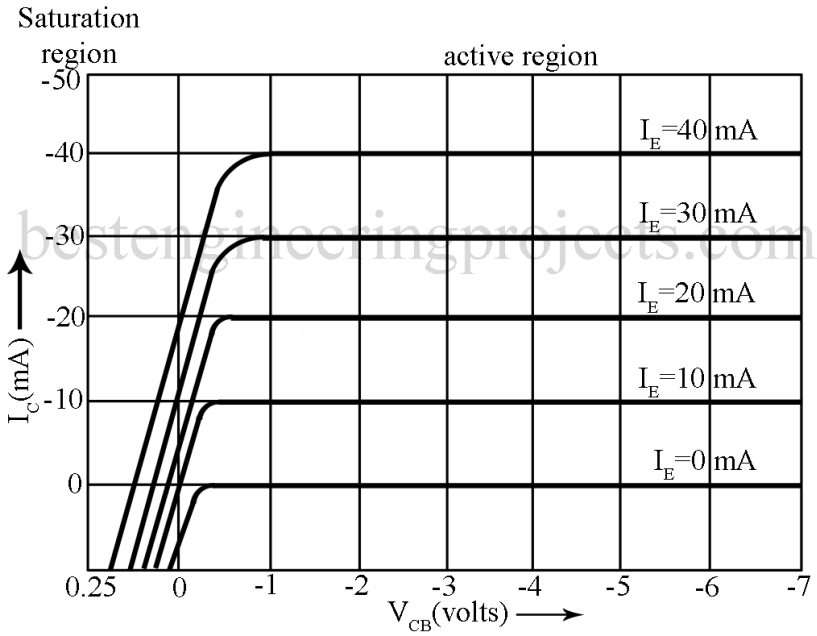


Figure 3: Static Output Characteristics of a typical PNP Ge grown junction transistor in CB configuration

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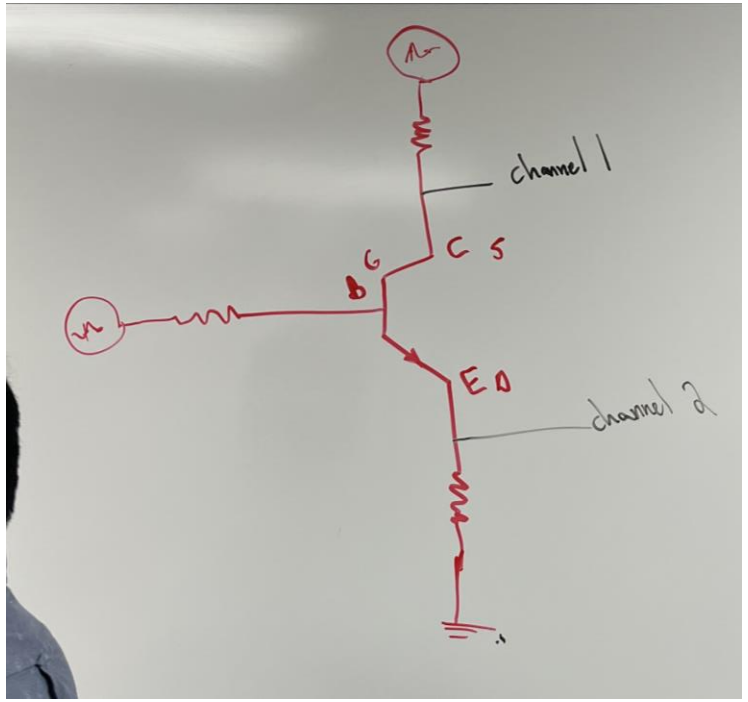
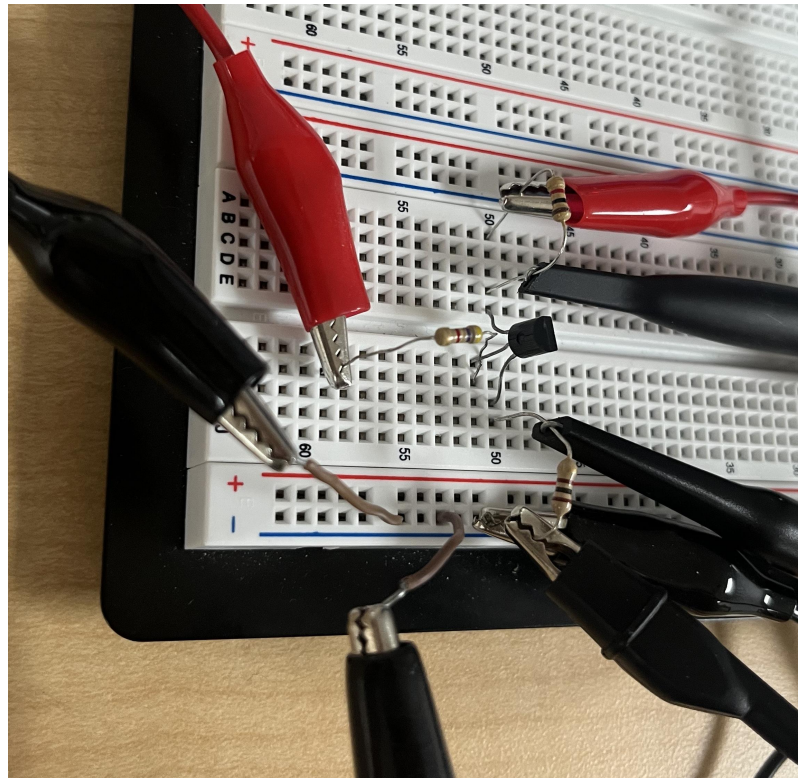
Curve Tracer Circuit Setup

- Function generator sweeps collector voltage with a triangle wave
  - Base current set using a resistor and triangle wave
  - Sense resistor converts current to voltage
  - Oscilloscope in X–Y mode displays Ic vs Vce





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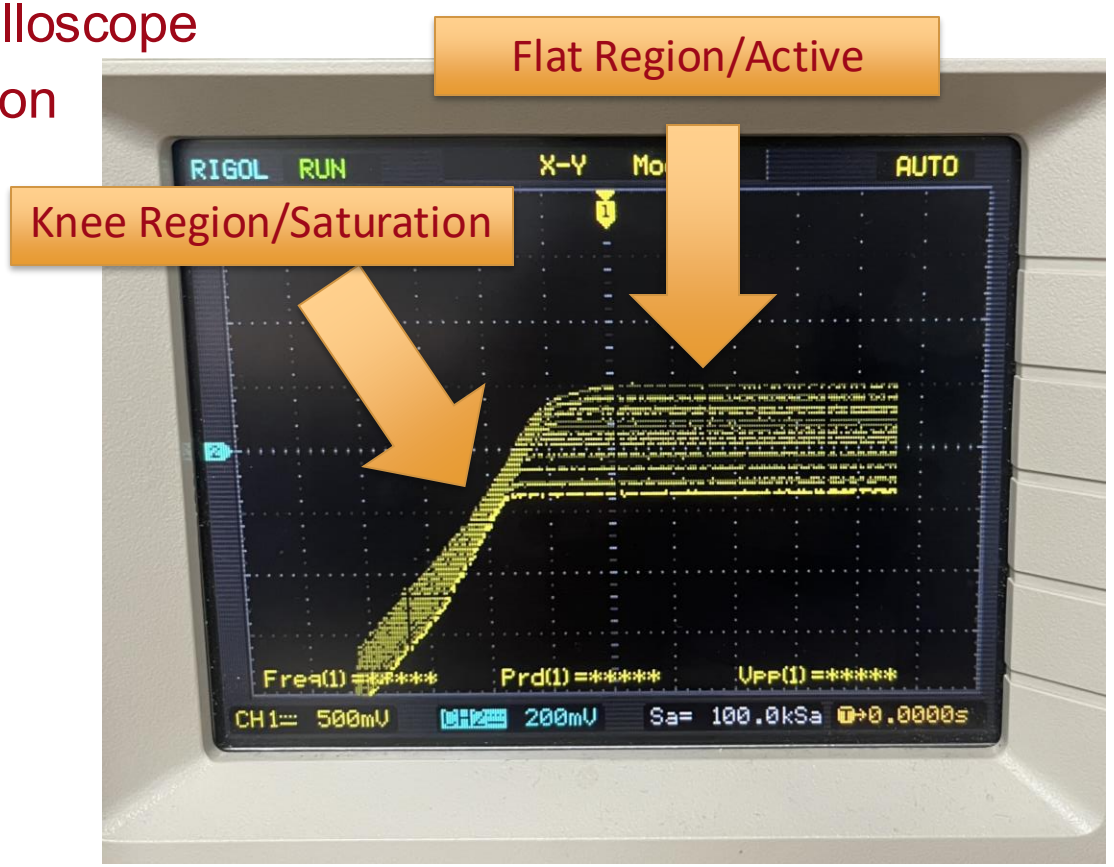
Results and Observations

- Multiple curves visible simultaneously on the oscilloscope
  - Flat regions indicate active transistor operation
  - Knee region shows saturation behavior
  - Curve spacing relates to transistor gain (β)



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