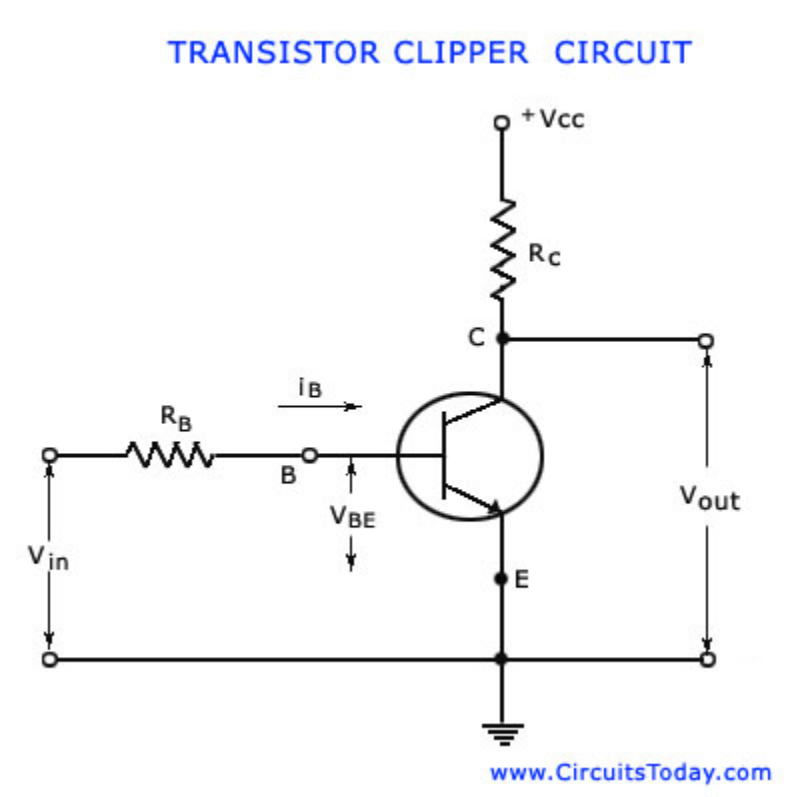
TRANSISTOR CLIPPING CIRCUITS

In this article, the transistor clipping circuits is explained in detail along with the circuit diagrams and waveforms. The transistor clipper circuit waveform for ramp and sinusoidal input is given below.

The transistor has two types of linearities —One linearity happens when the transistor passes from cut-in region to the active region. The other linearity occurs when the transistor passes from the active region to the saturation region. When any input signal passes through the transistor, across the boundary between cut-in region and active region, or across the boundary between the active region and saturation region, a portion of the input signal waveform will be clipped off. Portion of the input waveform which keeps the transistor in the active region shall appear at the output without any distortion. In such a case, it is the input current rather than the input voltage that should have the waveform of the signal of interest. Obvious reason is that over a large signal excursion in the active region, the transistor output current responds linearly to the input current but is related quite non-linearly to the input voltage. Therefore, a current drive is used in a transistor clipper, as illustrated in the figure given below.

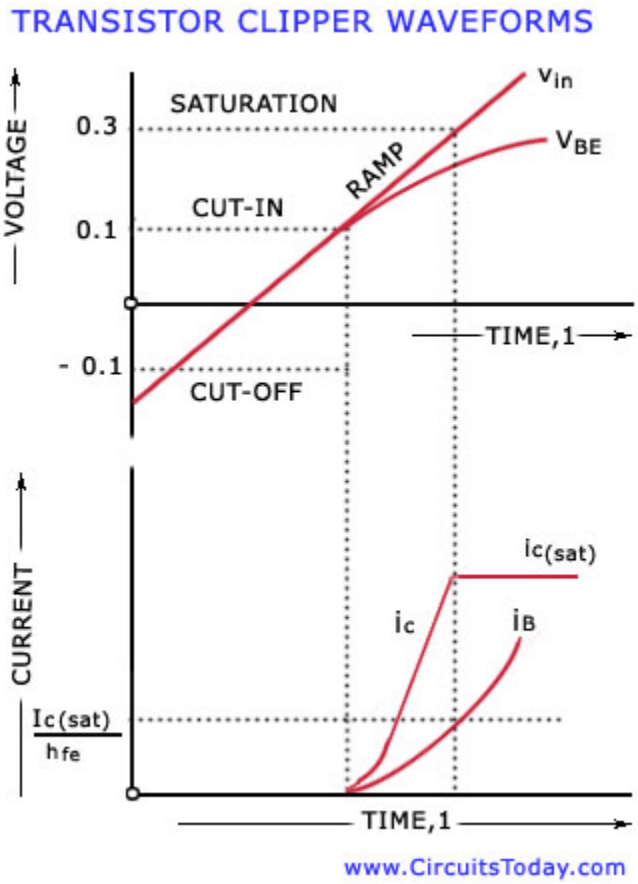


Transistor Clipper Circuit

In the active region, the value of the resistor R_B must be large enough when compared to the input resistance of the transistor. The input base current will have the waveform of input voltage and

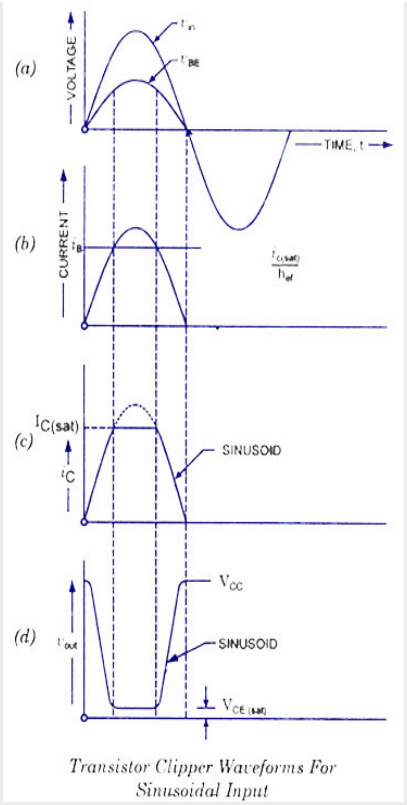
$i_B = v_{in}$ – base-to-emitter cut-in voltage / R_B

Waveforms for the transistor clipper for ramp input are shown in the figure given below.



The voltages are considered for a germanium transistor. The transistor will be working in the cut-off region at -0.1 V. When the voltage reaches 0.1 V, the transistor t starts conducting and will switch to the active region. When the voltage increases to 0.3 V, the transistor switches to the saturation region and the base-emitter voltage V_{BE} is limited to 0.3 V. As the transistor switches from the cut-off region to active region and then into saturation, the input base current i_B increases slowly. In the graph, the output current (collector current, I_c) will be of the same form as the input base current., when the transistor works in the active region. In saturation region, however collector current will become constant and becomes $Ic(_{sat})$.

Waveforms for the transistor clipper for sinusoidal input are shown in the figure below.



Transistor Clipper Waveforms For Sinusoidal Input

Transistor Clipper Waveform - Sinusoidal Input

Source : http://www.circuitstoday.com/transistor-clipping-circuits