

Voltage Electronics Electrical Engineering

## Why does base current decreases with increase in collector to emitter voltage in BJT input characteristics of common emitter configuration?

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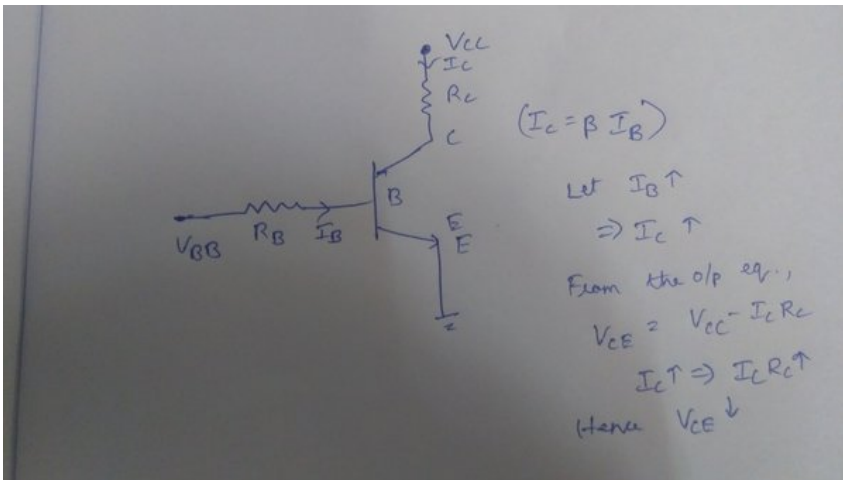


**Krishna Potluri**, Software Engineer (2017-present)

Answered May 2, 2017

It is not the current that decreases, it is the other way...if base current decreases,  $V_{ce}$  increases and vice versa.

Let us say, we are applying more base current,  $I_B$  is increased, due to the device gain, collector current  $I_C$  also increases, so the voltage drop across the collector resistance increases, which decreases our  $V_{ce}$ .



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**Ramachandran Vijayan**, Pursuing Ph.D. from SASTRA University, Thanjavur (2019)

Answered Sep 14, 2018

Before answering the question, I would like to mention some basic information that will help the further discussion.

"Base current mainly depends on the amount of recombination that happens in the base (Base contact supplies the electrons (holes) which is recombined with the injected holes (electrons) from the emitter in case of PNP (NPN) transistor)"

(Source: Streetman Book)

Coming to the answer constraining to the PNP discussion, by providing the reverse bias at the collector w.r.t. emitter ( $-V_{ce} = V_{ec} = V_{eb} + V_{bc}$ ), the collector - base junction is reverse biased. The reverse biased CB junction sweeps the holes injected from the emitter quickly which reduces the recombination probability inside the base.

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modulation effect as mentioned in Pierret book).

Hope it helps !

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**Sayantana Maiti**, Student at Techno India Salt Lake

Answered Dec 10, 2017

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Answered Sep 17, 2020



The cause and effect are reversed actually.

Base current is reduced due to lower drive at base ie. lower  $V_{be}$  reduces  $I_b$ . Consequently,  $I_c$  is reduced since  $I_c = \beta I_b$ . Reduced  $I_c$  leads to smaller voltage drop across  $R_c$ .  $V_{ce}$  is the residual voltage across collector emitter terminals after the voltage drop across  $R_c$  ie.

$$V_{ce} = V_{cc} - I_c R_c$$

where  $V_{cc}$  is the supply voltage (Eq 1)

Therefore, a reduction in  $I_c$  results in an increase in  $V_{ce}$  as seen from eq (1).

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