Transistor biasing in Integrated circuit of Electronics

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Abstract: ***In This paper we study about the transistor biasing in ICs. This phenomena if amplifier is found using discrete components self bias circuit can used but, if amplifier is made or fabricated on silicon chip then hence transistor in IC. Amplifier are biased using special circuit is called current mirror. In our paper we study about transistor biasing and also comparatively biasing. We know that in after various type of biasing like common collector (CC) common emitter (CE) common base (CB) were we study some constant term like (alpha beta Gama) in electronics era we know about various type of transistor like bipolar junction transistor (BJT) and field effect transistor (FET) basically the current mirror circuit is designed to copy current through one active device by controlling the current in another device a circuit keeping the output current constant regardless of loading the current the current mirror circuit is a low voltage analog and mixed mode circuit the current mirror circuit is a high input and output voltage swing capability the current mirror circuit is a current conversion and voltage conversion and current mirror circuit is a related to self bias circuit and using a active filter and then n often used circuit applying the bipolar junction transistor is the so called current mirror and input current is approximate and equal to output current.***

Keyword:- BJT, FET, Current Mirror.

1. Introduction

In our paper we study about current mirror circuit in any active mode then If amplifier is found using discrete components self bias circuit can be used but if an amplifier is made or fabricated on silicon chip self bias circuit can not Be used because the four resistance R1,R2,Rc,Re occupy large area on silicon Chip hence transistor in IC amplifier biased using special circuit called current Mirror the circuit in which the output current is forced to equal the input Current is said to be a current mirror thus in a current mirror circuit the output Current is a mirror image of the input current the current mirror is a special case of constant current bias and therefore can be used to set up constant emitter Current in differential amplifier note that the current mirror circuit requires Fewer components than constant current bias circuit because of its simplicity and ease to fabrication.this paper we study about then various type of transistor biasing its kind of bipolar junction transistor and field effect transistor .in electronics era we know about types of biasing BJT and FET then this type of biasing bipolar junction transistor biasing to operate the BJT in active region and to maintain the collector current and hence operating point stable and field effect transistor biasing we found that the relationship between input and output voltage is in non linear.

2. Methodology

The transistor biasing in a mainly used in bipolar junction transistor in this method by using a current mirror circuit by using and related to self biasing circuit then this process is to be define any active mode then current mirror circuit is a we know that in a transistor operating in its active mode then collector current is equal to output current is multiplied by the ratio off beta we know that the ratio between collector current and emitter collector current is called alpha the base emitter junction of a BJT is nothing more than a PN junction just like a diode and that the diode equation specifies how much current will go through PN junction given forward voltage drop and junction temperature If both junction voltage and temperature are held constant then the PN junction current will be constant.

ID = Is(e^qvd/NKT _ 1)
ID = Drain current
IS = Saturation current
e = Euler's constant
q = Charge of electron
k = Boltzmann's constant
T = Junction temperature in Kelvin
The current emitter circuit in then the form of basic current mirror circuit using BJT beta is large then.

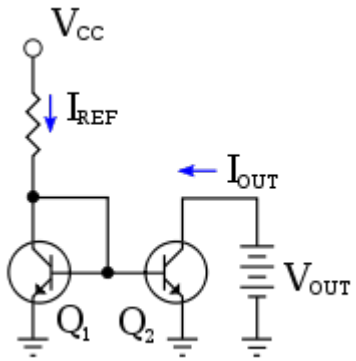

Figure1. Basic BJT current mirror circuit

Beta is neglected then input current is approximately equal to output current and then the since output current is a mirror image of input current this circuit is a called a current mirror circuit the various type off current mirror circuit.

1) Wilder current mirror
2) Wilson current source
3) Cascade current source.

The wilder current source circuit in operational amplifier low input current is required hence input stage is biased at very low current typically at a collector current of the order 5 micro ampere .current of such a low magnitude can be obtained is called a wilder current source the two transistor are identical to each other but due to the emitter resistance RE and Vbe1 and Vbe2 are different in fact Vbe2 < Vbe1 and hence Ic2 < Ic1. Due to asymmetric nature of other of the base emitter loop is called lens rather than mirror.

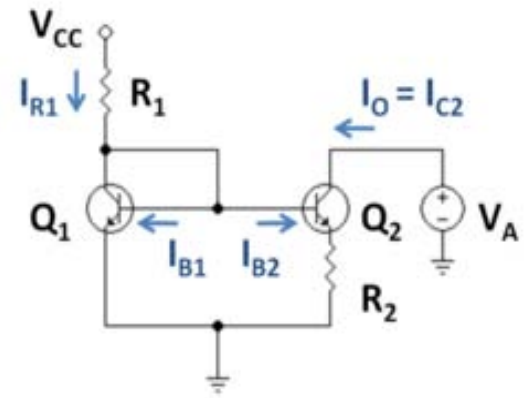

Figure2. Wilder current source

The Wilson current mirror is a three terminal circuit that at accept an input current at the input current. At the input terminals and provide a mirrored current source or sink output at the output terminal .the mirrored current source is precise copy of the input current .it may be used as Wilson current applying a constant bias current from and all the transistor have the same current gain beta.

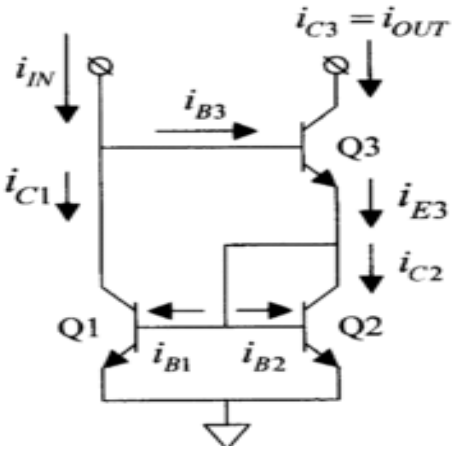

Figure3. Wilson Current Source

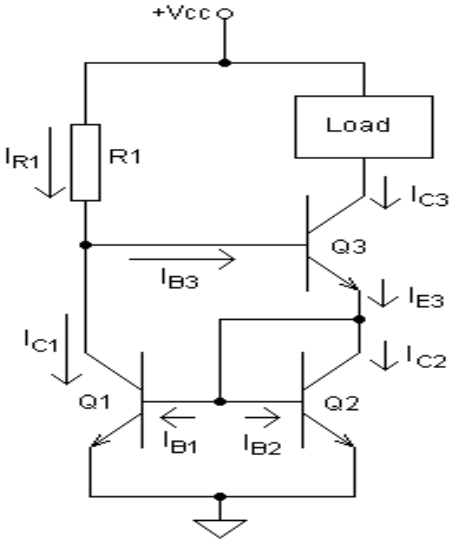

Figure .4 Wilson Current source circuit

The bipolar junction transistor is biasing to operate the BJT in active region or to locate the operating point in active region to maintain the collector current and hence operating point system when we biased a transistor we establish a certain current and voltage condition for transistor these condition are called as operating point.

The BJT in this 3 type of biasing

1) Fixed bias

2) Collector to base bias

3) Self bias.

The fixed bias circuit it is a single register base bias circuit as a n type emitter is grounded VE = 0 if RC is properly selected than the collector voltage can be minted higher than the base voltage and thus collector junction operate in reverse bias for a fixed bias circuit stability for (S = 1+ beta)

since beta is a large number fixed biased circuit has large stability factor or its collector current is unstable since base current is fixed this circuit is called fixed bias circuit.

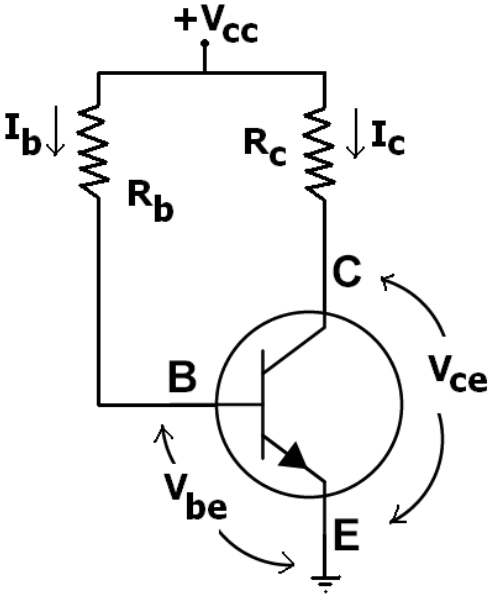

Figure.5 Fixed bias Circuit

Collector to base bias circuit in this circuit base bias or base voltage from collector by connecting resistance RB from collector to base since VB > 0 and VE =0 emitter junction operates in forward bias due to voltage drop across RB VC> VB and hence collector junction in reverse bias in this circuit stability factor can be reduced by decreasing the any resistance or increasing any resistance then if assume R1>>R2 then (S =1) in this better stability in collector current in comparison to fixed bias.

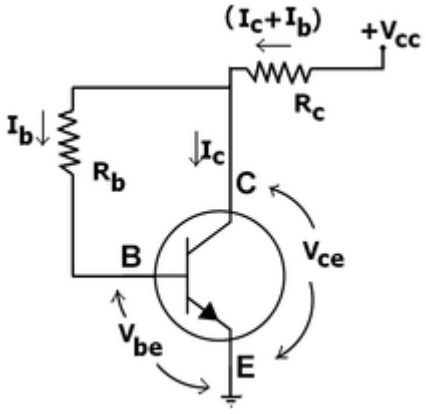

Figure.6: Collector to base bias circuit

Self bias circuit and also known as voltage divider bias circuit in this 2 resistance in parallel connected in any voltage source is required R1 and R2 voltage divider network if any resistance is properly selected collector voltage can be maintained higher then base voltage and thus transistor having collector function operate in reverse.

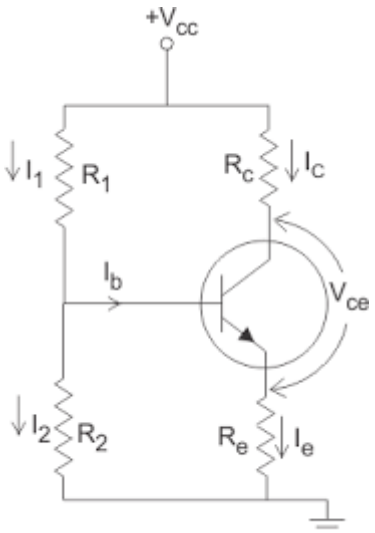

Figure7. Self bias Circuit

3. Application

1) Current mirror circuit of its simplicity and ease of fabrication.
2) The current mirror circuit is most commonly used in integrated amplifiers such as differential and operational amplifiers.
3) It is used as constant current source to bias transistors in IC amplifiers.
4) It can be used s load in the amplifiers such load is called active load.

4. Future Scope

1) Study of the effect of stray capacitors and temperature dependence of device.
2) Design various tunable multifunction filters and oscillators circuit.

5. Conclusion

If smaller output current is required then resistance becomes very large and current mirror will occupy higher area on silicon chip Basic current mirror can not be used if smaller output current is desired Input current is approximate and equal to output current.

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