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Low power consumptions high speed Class B amplifier

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Abstract- In this paper we present new combinations to design class B amplifiers which consume extremally low power consumptions in the range of nanowatt, temperature stability of this combinations is very high from -100^0c to 200^0c. These combinations reported that PAE more than 72%. Volage gain 36.6dB and bandwidth range in MHz. Proposed pair design with the help of combinations of Darlington pair and Szikli pair. Darlington pair increases the voltage gain and Szikli provided bandwidth, therefor this pair reported high voltage gain and larger bandwidth.

Key words- Darlington pair, Szikli pair, low power consumptions, temperature stability, bandwidth

Introduction- Long-term use of battery-operated devices is an important challenge in present times. To meet this challenge, simply increasing the battery capacity is not enough as it will increase the weight and size of the portable device. Therefore, this challenge cannot be controlled by increasing the capacity of the battery, but if somehow the power consumption is controlled, then this challenge can be controlled to a great extent, but along with this control, this thing Care should be taken not to affect the basic properties of the device i.e., voltage gain and bandwidth.

The determination of the efficiency of the transmitter used in the communication system depends on the fact that how much is the overall efficiency of the power amplifier. The main focus of any power amplifier is how well it can convert dc input power to ac input power to rf/micro wave output power without any harmonic distortion. To achieve this goal, the classical class b amplifier has been built. The most important feature of class b is that its efficiency is up to 78%, it also has a drawback, its conducting angle is 180 degree or semi-circular. Hence the class ab of the complete circle was constructed. In which two transistors have been used, in the first half cycle the first transistor is on, in the second cycle the second transistor is on, thus the conducting angle is up to 360.

In fact, there are many general paper and books available for class b amplifier study. These amplifiers designed using either complimentary compound pair or other method, basically two methods widely used to design class B amplifier one is Darlington and other is Szikli. This paper divided into four parts, first is introduction second reference and expletory circuit third simulation and result and fourth is discussions.

Part II reference and expletory circuits-

In this part of the article, we have presented the proposed circuit along with the reference circuit, the triplet transistor configurations are used for the first time in the construction of the reference class b amplifier and 25-volt DC voltage used with Diode and resistance for circuit stability. In the constructions of the proposed circuit, we have used Darlington and Szikli pair with one MOS transistor to design class B amplifier. One more thing we used triplet diode with resistance for circuit stability of the circuit.

The proposed and reference circuit are shown in the figure below.

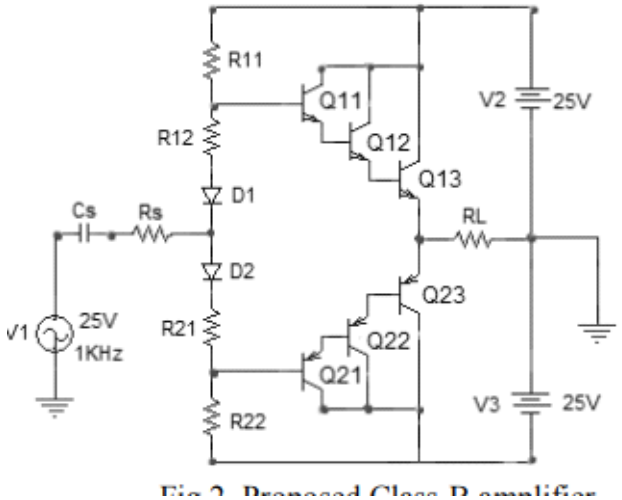

Figure 1- reference circuit

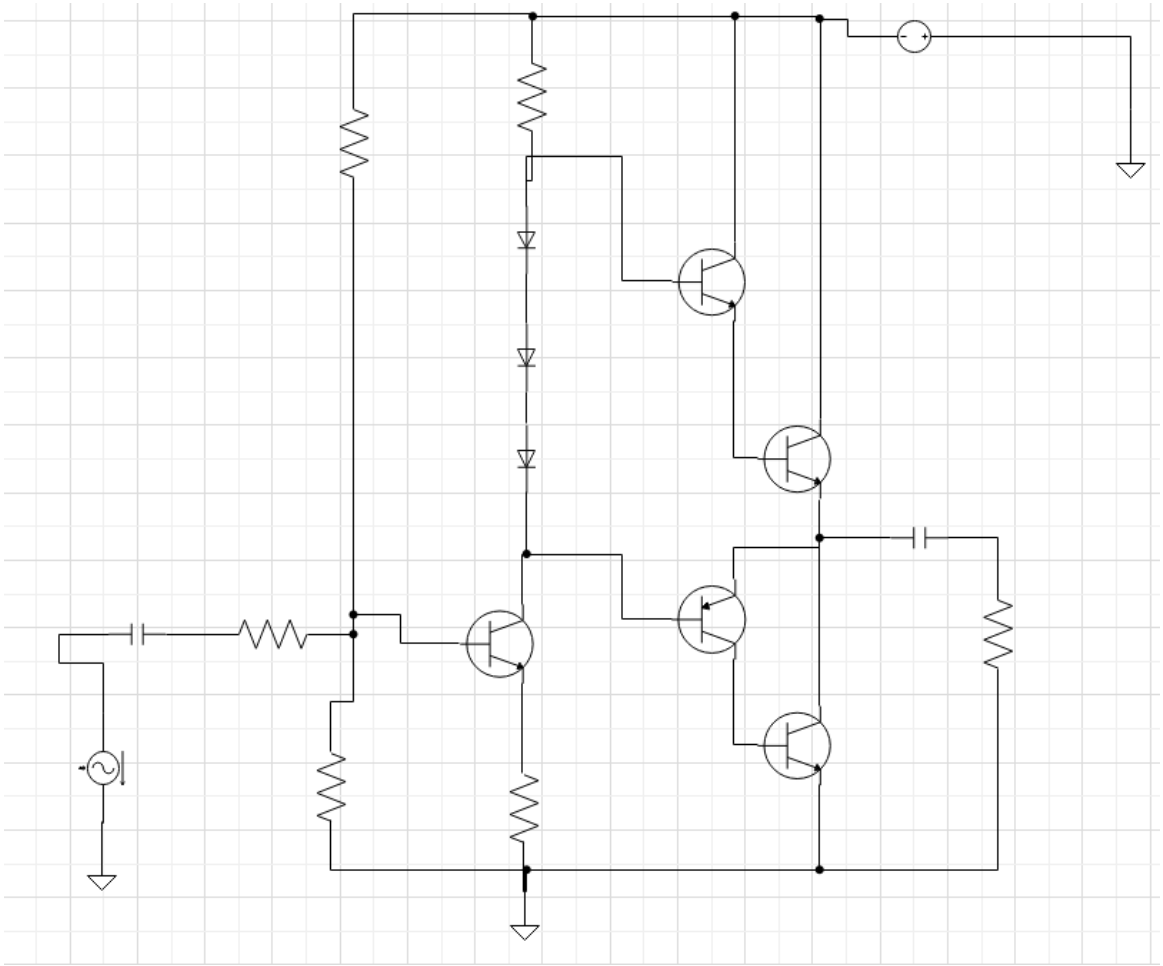

Figure 2- Proposed circuit

The detailed of the component used in the proposed and reference circuit are presented in table -1

Table -1

Detailed of circuit components

Components	Reference	Proposed
Transistor1	NPN, β=255.9	**NPN** , β=200
Transistor 2	Q2N2907A (PNP, β=231.7)	
C_i	**10µF**	**10µF**
R_i	**100Ω**	**100Ω**
R_1 &R_2	**300KΩ &300KΩ**	**45KΩ 5 KΩ**
R_3	**-**	**1KΩ**
R_E	**-**	**1KΩ**
V_1	**25V, IKHz**	**1mV, IKHz**
V_2	**25V**	**10V**
V_3	**25V**	**-**
D_1, &D_2	**D1N4002**	
D_1, D_2 &**D_3**	**-**	**Pdiode**

Simulations and result- the proposed circuit has been designed and studies on the Cadence virtuoso software using 180nm technology. Various parameters of the circuit designed in study such as bandwidth, efficiency, temperature stability power consumptions etc, has been studies with the help of software and formula available in books and research papers.

Figure-3- Comparisons of gains between proposed and reference circuit

Second comparisons are temperature stability of reference and proposed circuits, reference circuit much stable between -40^0C to 100^0C and proposed circuit much stable between -100^0C to 100^0C.

Third comparisons dc voltage variations and studied gain variations of reference and proposed circuit.it can easily understood by below graph

Figure 4- DC voltage and gain variations graph

Transient response of proposed circuit are presented in below graph

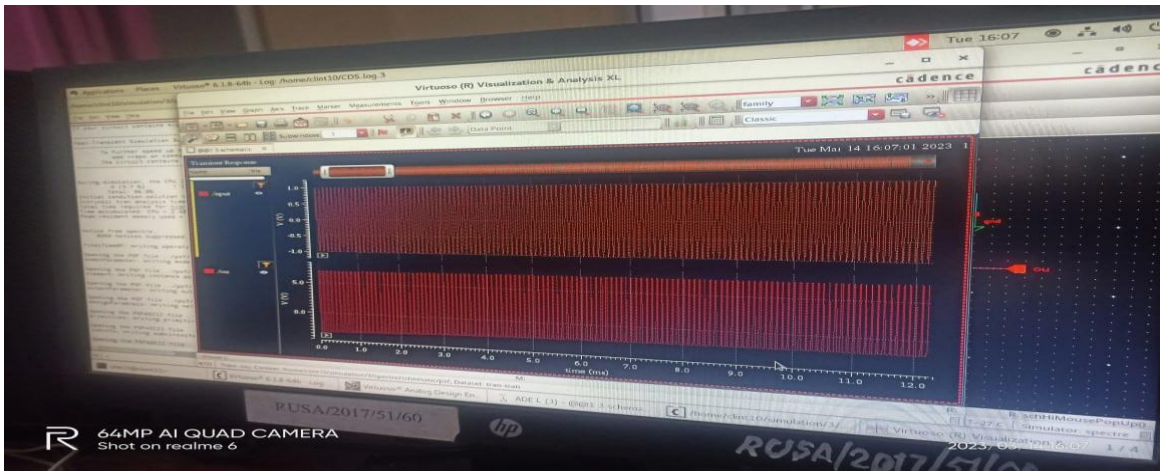

Figure-5- transient response of proposed circuit.

Conclusions- From above studies and simulation of reference and proposed circuit we conclude that proposed circuit much better than the reference circuit it's easily under stood by below summary table.

Parameters	**refences**	**proposed**
Bandwidth	MHz	MHz
Gain	15.83db	36.6db
Temperature stability	-40to 100	-100 to 100
Power consumptions	-	mW
Noise analysis	-	pHz
Vdc vs gain	Linearly increase	Linearly increase
PAE	73.25%	76.3%

The combinations of Darlington and Szikli pair provided better result in terms of bandwidth and gain, especially gain is much larger than either Szikli or Darlington pair. Temperature stability, power consumptions, noise etc are much better than Szikli and Darlington pair.

Future remark- from above study it is clear that combinations of Darlington and Szikli pair provided new hope to design power and small signal amplifier.

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