DESIGN AND ANALYSIS OF BAND GAP REFERENCE CIRCUITS

A

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I, **Vivek Mittal**, Roll No. **2K15/C&I/21**, student of **M. Tech (Control & Instrumentation)**, herewith declare that the thesis titled "***Design and Analysis of Band Gap Reference Circuits***", under the supervision of Prof. Pragati Kumar of Electrical Engineering Department, Delhi Technological University, in partial fulfilment of the need for the award of the degree of master of technology, has not been submitted elsewhere for the award of any degree.

I herewith solemnly and sincerely confirm that all the particulars declared above by me are true and correct to the best of my knowledge and belief.

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Certificate

This is to certify that the dissertation entitled "***Design and Analysis of Band Gap Reference Circuits***" submitted by **Vivek Mittal** in completion of major project dissertation for the master of Technology degree in **Control & Instrumentation** at Delhi Technological University is an authentic work carried out by him under my superintendence and guidance.

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ABSTRACT

In this dissertation titled "***Design and Analysis of Band Gap Reference Circuits***", we discuss the importance of Band Gap Reference circuits and their design.

We start our discussion with two important building blocks of any band gap reference circuit i.e. circuits exhibiting the CTAT (Complementary to absolute temperature) and PTAT (Proportional to absolute temperature) nature.

We later combine the above CTAT and PTAT designs to obtain a constant reference voltage which is fairly independent of temperature and supply variations over a certain pre-defined range and can be practically used in analog IC design of various electronic components.

Further in our dissertation we discuss certain improvements in design of our band gap reference circuits and conclude with future scope and promises the band gap reference circuits withheld in the field of electronic design.

Throughout our dissertation we analysed and simulated all the circuits using the Cadence Design Systems Software.

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LIST OF SYMBOLS

S.No	Symbols	Descriptions
1	CMOS	Complementary Metal Oxide Semiconductor
2	NMOS	N-type Metal Oxide Semiconductor
3	PMOS	P-type Metal Oxide Semiconductor
4	BGR	Band Gap Reference
5	MOSFET	Metal Oxide Semiconductor Field Effect Transistor
6	Op-Amp	Operational Amplifiers
7	V_{ref}	Reference Voltage
8	V_{dd}	Supply Voltage
9	V_T	Thermal Voltage
10	w.r.t	with respect to
11	gnd	ground
12	PTAT	Proportional to absolute temperature
13	CTAT	Complementary to absolute temperature
14	k	Boltzmann's constant
15	q	Electric charge
16	T	Temperature
17	n_i	Intrinsic carrier concentration
18	μ	Mobility
19	ε_g	Energy band gap
20	I_o	Diode Current
21	I_s	Reverse Saturation Current

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