US006057721A

United States Patent [19]

Nolan et al.

[11] **Patent Number: 6,057,721**

[45] **Date of Patent: May 2, 2000**

[54] **REFERENCE CIRCUIT USING CURRENT FEEDBACK FOR FAST BIASING UPON POWER-UP**

[75] Inventors: **James B. Nolan**, Chandler; **David Susak**, Phoenix, both of Ariz.

[73] Assignee: **Microchip Technology Incorporated**, Chandler, Ariz.

[21] Appl. No.: **09/065,003**

[22] Filed: **Apr. 23, 1998**

[51] **Int. Cl.**[7] **H03L 7/00**

[52] **U.S. Cl.** **327/143**; 327/543

[58] **Field of Search** 323/311, 312, 323/313, 314, 315, 316, 901; 327/142, 143, 198, 530, 534, 535, 538, 539, 540, 541, 542, 543, 545, 546

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,399,399	8/1983	Joseph	323/315
4,857,823	8/1989	Bitting	323/314
5,087,830	2/1992	Cave et al.	307/296.6
5,610,506	3/1997	McIntyre	323/313
5,646,518	7/1997	Lakshmikumar et al.	323/316
5,742,155	4/1998	Susak et al.	323/901
5,751,142	5/1998	Dosho et al.	323/316
5,856,742	1/1999	Vulih et al.	323/315
5,861,737	1/1999	Goerke et al.	323/282
5,861,771	1/1999	Matsuda et al.	327/540
5,867,013	2/1999	Yu	323/314

Primary Examiner—Timothy P. Callahan
Assistant Examiner—Jeff Zweizig
Attorney, Agent, or Firm—Ronald L. Chichester; Paul N. Katz; Frohwitter

[57] **ABSTRACT**

A fast start-up circuit for use in integrated circuits where there are internal nodes of reference circuits that need to be charged to a predetermined voltage level at a quicker rate than that delivered by the typical ramping up of supply power. The circuit a current driven approach, which is unique from the voltage driven approaches found in the prior art. The circuit is comprised of a high gain reference circuit and a current generator. The reference circuit is comprised of a bias generator and a high gain amplifier. The invention is characterized by a current generator which is capable of rapidly injecting relatively high levels of current into the reference circuit or sinking relatively high levels of current from the reference circuit or both. The invention is further characterized by a current driven feedback loop which deactivates the current generator once start-up is achieved and the high gain reference circuit approaches the quiescent point.

6 Claims, 2 Drawing Sheets

