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(54) **MULTI-CHANNEL PROGRAMMABLE GAIN AMPLIFIER CONTROLLED WITH A SERIAL INTERFACE**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

5,367,474 A * 11/1994 Auer et al. 702/21
5,574,678 A * 11/1996 Gorecki 708/801
5,604,757 A * 2/1997 Liang et al. 372/38.04
5,751,234 A * 5/1998 Schlotterer et al. 341/139
5,886,658 A * 3/1999 Amar et al. 341/155
5,986,357 A * 11/1999 Myron et al. 307/116
6,184,660 B1 * 2/2001 Hatular 320/141
6,226,322 B1 * 5/2001 Mukherjee 375/229
6,424,209 B1 * 7/2002 Gorecki et al. 327/554
6,542,035 B2 * 4/2003 Cook et al. 330/286
6,628,170 B2 * 9/2003 Titus 330/278

OTHER PUBLICATIONS

Blake, K.E., "A Simplifid–Transistor Macromodel of a High–Speed Multiplier/VGA", Aug. 1993, Circuits and Systems, 1993, vol. 2, pp. 1349–1352.*

* cited by examiner

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(57) **ABSTRACT**

A programmable gain amplifier (PGA) controlled through a serial communications interface are fabricated on an integrated circuit (IC). A multiplexer (MUX) may also be included on the IC. The serial communications interface controls the gain of the PGA, MUX channel selection, and other functions of the PGA. Status of the PGA may also be obtained through the serial communications interface. By using a serial communications interface, the pin count of the PGA IC package may be kept to a minimum.

44 Claims, 2 Drawing Sheets

