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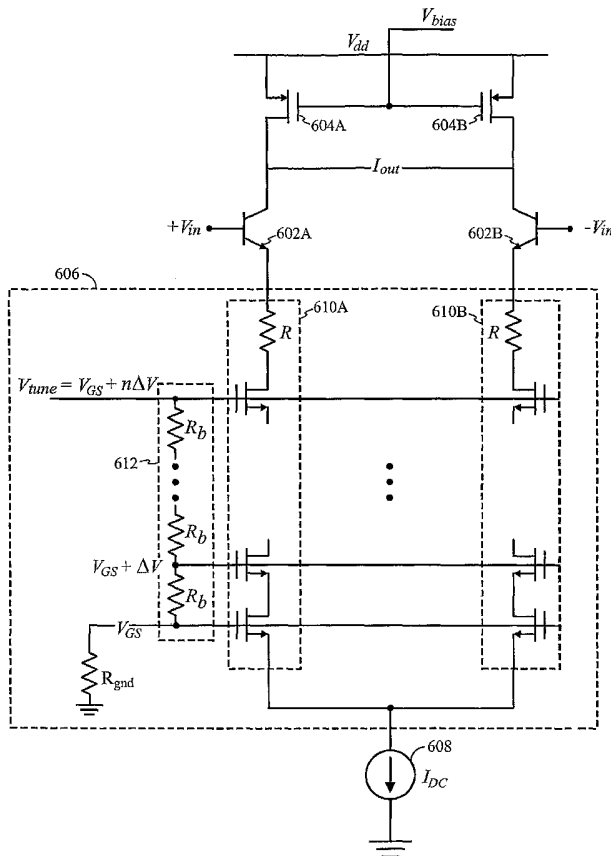
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[Continued on next page]

(54) Title: A LINEAR TRANSCONDUCTANCE CELL WITH WIDE TUNING RANGE



(57) Abstract: A transconductance cell is disclosed. The transconductance cell may be single-ended or differential. The transconductance cell may include a tunable degeneration circuit. The tunable degeneration circuit may have a plurality of field effect transistors connected in series with each of the field effect transistors having a gate configured to receive a tuning voltage.

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Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report*

(88) Date of publication of the international search report:

27 July 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

PCT/US2005/033445

A. CLASSIFICATION OF SUBJECT MATTER

INV. H03F3/45

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 11, 30 September 1999 (1999-09-30) & JP 11 168334 A (HITACHI LTD), 22 June 1999 (1999-06-22) abstract	1, 2
X	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 10, 8 October 2003 (2003-10-08) & JP 2003 168938 A (SANYO ELECTRIC CO LTD), 13 June 2003 (2003-06-13) abstract	1
X	US 6 600 373 B1 (BAILEY JAMES ARTHUR ET AL) 29 July 2003 (2003-07-29) figure 3	1
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 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

23 January 2006

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12.05.2006

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INTERNATIONAL SEARCH REPORT

PCT/US2005/033445

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 587 965 A (SGS-THOMSON MICROELECTRONICS S.R.L.; STMICROELECTRONICS S.R.L) 23 March 1994 (1994-03-23) column 3, line 49 - column 4, line 22; figure 3 -----	1
X	US 5 612 648 A (MCCLELLAN ET AL) 18 March 1997 (1997-03-18) column 2, line 51 - line 63; figure 5. -----	1
A	EP 0 726 652 A (ALCATEL BELL NAAMLOZE VENNOOTSCHAP; ALCATEL) 14 August 1996 (1996-08-14) figure 1 -----	1
A	US 5 978 241 A (LEE ET AL) 2 November 1999 (1999-11-02) figure 2B -----	1
A	US 5 999 055 A (KIMURA ET AL) 7 December 1999 (1999-12-07) figure 1 -----	1

INTERNATIONAL SEARCH REPORT

PCT/US2005/033445

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1,2

A transconductance cell comprising a tunable degeneration circuit having a plurality of field effect transistors and a feedback resistor connected in series with the field effect transistors.

2. claims: 3-20

A transconductance cell comprising a tunable degeneration circuit having a plurality of field effect transistors and a tapped voltage divider network configured to apply a tuning voltage to each of the field effect transistors.

3. claim: 21

A transconductance cell comprising a tunable degeneration circuit having a plurality of field effect transistors and a shunt capacitor coupled to the output of the transconductance cell.

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/US2005/033445

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 11168334	A	22-06-1999	NONE	
JP 2003168938	A	13-06-2003	NONE	
US 6600373	B1	29-07-2003	NONE	
EP 0587965	A	23-03-1994	DE 69229731 D1 DE 69229731 T2 JP 6216657 A US 5726604 A	09-09-1999 23-12-1999 05-08-1994 10-03-1998
US 5612648	A	18-03-1997	NONE	
EP 0726652	A	14-08-1996	AU 711403 B2 AU 4216696 A CA 2169235 A1 DE 69523281 D1 DE 69523281 T2 ES 2162891 T3 US 5661432 A	14-10-1999 22-08-1996 11-08-1996 22-11-2001 11-07-2002 16-01-2002 26-08-1997
US 5978241	A	02-11-1999	NONE	
US 5999055	A	07-12-1999	GB 2328332 A JP 11068477 A	17-02-1999 09-03-1999