



- (51) **International Patent Classification:**
H03F 3/00 (2006.01) *H03F 3/45* (2006.01)
- (21) **International Application Number:**
PCT/US2012/041170
- (22) **International Filing Date:**
6 June 2012 (06.06.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
- | | | |
|------------|------------------------------|----|
| 61/493,949 | 6 June 2011 (06.06.2011) | US |
| 61/493,951 | 6 June 2011 (06.06.2011) | US |
| 61/493,953 | 6 June 2011 (06.06.2011) | US |
| 61/504,680 | 5 July 2011 (05.07.2011) | US |
| 13/271,130 | 11 October 2011 (11.10.2011) | US |
- (71) **Applicant (for all designated States except US):** **QUALCOMM Incorporated** [US/US]; Attn: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **SHAH, Peter J.** [DK/US]; 5775 Morehouse Drive, San Diego, California 92121 (US). **TALEIE, Shahin Mehdizad** [IR/US]; 5775 Morehouse Drive, San Diego, California 92121 (US). **GROENEWOLD, Gerrit** [NL/US]; 5775 Morehouse Drive, San Diego, California 92121 (US). **MIAO, Guoqing** [US/US]; 5775 Morehouse Drive, San Diego, California 92121 (US). **SUNG, Eunyoung** [KR/US]; 5775 Morehouse Drive, San Diego, California 92121 (US).
- (74) **Agent:** **MOBARHAN, Ramin**; Attn: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121 (US).
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

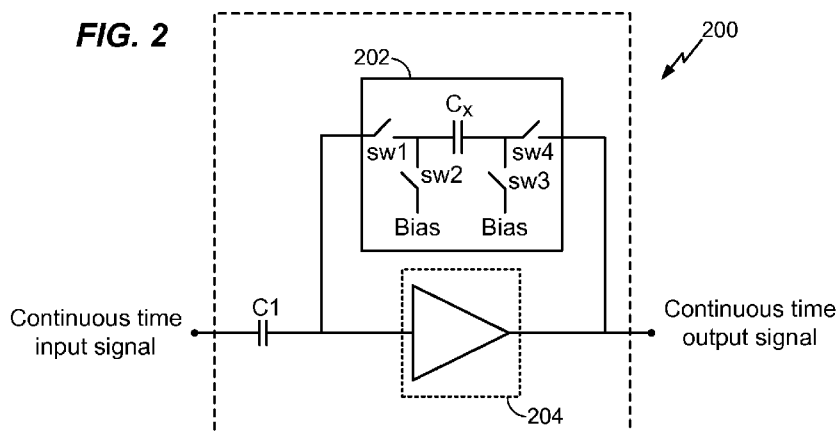
Declarations under Rule 4.17:

- 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 (Art. 21(3))

[Continued on next page]

(54) **Title:** SWITCHED-CAPACITOR DC BLOCKING AMPLIFIER

(57) **Abstract:** A switched-capacitor DC blocking amplifier is disclosed. In an embodiment, an integrated circuit is provided that includes an amplifier having an amplifier input and an amplifier output, a capacitor connected to the amplifier input and configured to receive an input signal, and a switched capacitor circuit coupled to provide a resistance between the amplifier input and the amplifier output. In one implementation, the switched capacitor circuit is configured with a feed forward circuit to reduce aliasing. In another implementation, the switched capacitor circuit includes a switched impedance circuit to reduce noise.



(88) Date of publication of the international search report:
28 March 2013

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/041170

A. CLASSIFICATION OF SUBJECT MATTER

INV. H03F3/00 H03F3/45
ADD.

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 H03H

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 035 049 A (ENGH LAWRENCE D [US] ET AL) 7 March 2000 (2000-03-07) abstract figures 4-7 column 3, line 31 - column 5, line 53 -----	1-11, 13-19
A	US 6 411 717 B1 (LUEBBE JUERGEN [DE] ET AL) 25 June 2002 (2002-06-25) abstract figures 1-4 paragraph [0002] - paragraph [0003] paragraph [0023] paragraph [0034] - paragraph [0042] ----- -/-	9-11,18, 19



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 application or patent 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

"&" document member of the same patent family

Date of the actual completion of the international search

13 December 2012

Date of mailing of the international search report

20/12/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Mouanda, Thierry

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/041170

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 159 014 A (SECR DEFENCE) 20 November 1985 (1985-11-20) abstract figures 5-6 page 1, line 1 - line 30 page 2, line 18 - page 3, line 53 -----	2,3, 9-11,14, 15,18,19
X	VERMA N ET AL: "A Micro-Power EEG Acquisition SoC With Integrated Feature Extraction Processor for a Chronic Seizure Detection System", IEEE JOURNAL OF SOLID-STATE CIRCUITS, IEEE SERVICE CENTER, PISCATAWAY, NJ, USA, vol. 45, no. 4, 1 April 2010 (2010-04-01), pages 804-816, XP011305763, ISSN: 0018-9200, DOI: 10.1109/JSSC.2010.2042245 abstract -----	1-5, 7-11, 14-19
A	US 2010/327965 A1 (FAGG RUSSELL J [US]) 30 December 2010 (2010-12-30) abstract paragraph [0031] figures 3-4 -----	9-11,18, 19
X	JP 2006 148320 A (DENSO CORP) 8 June 2006 (2006-06-08) abstract figure 1 -----	12,20
A	JP 2002 204144 A (JAPAN RADIO CO LTD) 19 July 2002 (2002-07-19) abstract figure 1 -----	12,20
X	XIAODAN ZOU ET AL: "A 1-V 450-nW Fully Integrated Programmable Biomedical Sensor Interface Chip", IEEE JOURNAL OF SOLID-STATE CIRCUITS, IEEE SERVICE CENTER, PISCATAWAY, NJ, USA, vol. 44, no. 4, 1 April 2009 (2009-04-01), pages 1067-1077, XP011254339, ISSN: 0018-9200, DOI: 10.1109/JSSC.2009.2014707 abstract figures 10,11,15-18 I. Introduction III. The analog front-end B. Programmable Gain Amplifier ----- -/--	12,20

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/041170

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MING YIN ET AL: "A Low-Noise Preamplifier with Adjustable Gain and Bandwidth for Biopotential Recording Applications", CIRCUITS AND SYSTEMS, 2007. ISCAS 2007. IEEE INTERNATIONAL SYMPOSIUM ON, IEEE, PI, 1 May 2007 (2007-05-01), pages 321-324, XP031181262, ISBN: 978-1-4244-0920-4 abstract figure 1 I. Introduction II. amplifier Design -----	12,20
A	HIROKAZU YOSHIKAWA ET AL: "MOSFET-Only Switched-Capacitor Circuits in Digital CMOS Technology", IEEE JOURNAL OF SOLID-STATE CIRCUITS, IEEE SERVICE CENTER, PISCATAWAY, NJ, USA, vol. 34, no. 6, 1 June 1999 (1999-06-01), XP011061030, ISSN: 0018-9200 the whole document -----	12,20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/041170

Box No. 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 No. 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 fees, this Authority did not invite payment of additional fees.
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.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ 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: 1-11, 13-19

switch capacitor circuit having an anti aliasing filter
circuit in the feed forward path

2. claims: 12, 20

switch capacitor circuit with an impedance circuit parallel
connected to said SC for power supply noise or distortion
suppression

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/041170

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6035049	A	07-03-2000	NONE
US 6411717	B1	25-06-2002	DE 19630416 C1 23-10-1997 EP 0821483 A2 28-01-1998 JP 10233653 A 02-09-1998 US 6411717 B1 25-06-2002
GB 2159014	A	20-11-1985	NONE
US 2010327965	A1	30-12-2010	US 2010327965 A1 30-12-2010 WO 2011008472 A2 20-01-2011
JP 2006148320	A	08-06-2006	NONE
JP 2002204144	A	19-07-2002	JP 4707229 B2 22-06-2011 JP 2002204144 A 19-07-2002