

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
11 December 2008 (11.12.2008)

PCT

(10) International Publication Number  
**WO 2008/149259 A3**

- (51) International Patent Classification:  
*H03M 1/46* (2006.01)
- (21) International Application Number:  
PCT/IB2008/052080
- (22) International Filing Date: 27 May 2008 (27.05.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
07109697.8 6 June 2007 (06.06.2007) EP
- (71) Applicant (for all designated States except US): **NXP B.V.** [NL/NL]; High Tech Campus 60, NL-5656 AG Eindhoven (NL).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **LOUWSMA, Simon, M.** [NL/NL]; c/o NXP Semiconductors, IP Department, HTC 60 1.31 Prof Holstlaan 4, NL-5656 AG Eindhoven (NL). **VERTREGT, Maarten** [NL/NL]; c/o NXP Semiconductors, IP Department, HTC 60 1.31 Prof Holstlaan 4, NL-5656 AG Eindhoven (NL).
- (74) Agent: **VAN DER VEER, Johannis, L.**; c/o NXP Semiconductors, IP Department, HTC 60 1.31 Prof Holstlaan 4, NL-5656 AG Eindhoven, (NL).
- (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, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

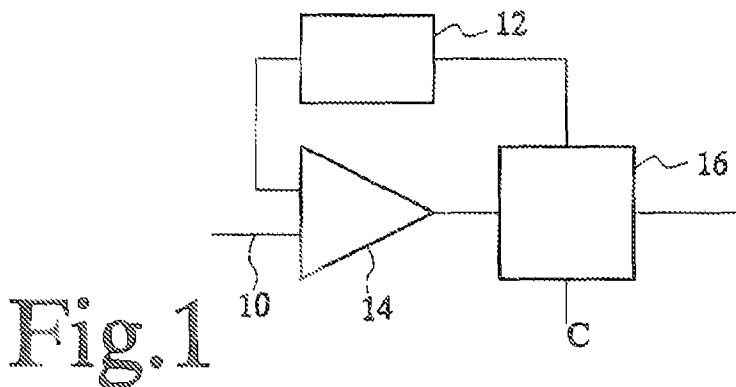
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

- (88) Date of publication of the international search report:  
29 January 2009

(54) Title: CIRCUIT WITH A SUCCESSIVE APPROXIMATION ANALOG TO DIGITAL CONVERTER



(57) Abstract: During successive approximation analog to digital conversion a series of successive digital reference values is selected that converges towards a digital representation of an analog input signal. An analog reference signal is generated dependent on the successive digital reference values and compared to the analog input signal. The digital reference values are selected dependent on comparison results. In the selection of the digital reference values successive steps between digital reference values are each selected dependent on values of the comparator result from a plurality of preceding recursion cycles. The comparison results define a series of

successively narrower ranges of digital values that contain a digital representation of the analog input signal. Use of a plurality of comparator results for selecting the steps in the digital reference values makes it possible to reduce uncertainty about whether the comparison result has settled. This in turn makes it possible to reduce the sizes of the successive ranges, which speeds up convergence.

WO 2008/149259 A3

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/IB2008/052080A. CLASSIFICATION OF SUBJECT MATTER  
INV. H03M1/46

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)  
H03M

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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 351 231 B1 (PRICE COLIN C [GB] ET AL) 26 February 2002 (2002-02-26) columns 5-8; figures 2A, 3	1-9
X	WO 99/55005 A (ERICSSON TELEFON AB L M [SE]) 28 October 1999 (1999-10-28) pages 3-6; figure 3	1, 9
A	WO 99/04496 A (MICROCHIP TECH INC [US]) 28 January 1999 (1999-01-28) pages 8-12; figure 4	1-9

 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.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

20 November 2008

Date of mailing of the international search report

26/11/2008

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

Morrish, Ian

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2008/052080
---------------------------------------------------

Patent document cited in search report	Publication date	Patent family member(s)	Publication date																																	
US 6351231	B1	26-02-2002	NONE																																	
WO 9955005	A	28-10-1999	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">AU</td> <td style="width: 40%;">4178299 A</td> <td style="width: 50%;">08-11-1999</td> </tr> <tr> <td>CA</td> <td>2329119 A1</td> <td>28-10-1999</td> </tr> <tr> <td>CN</td> <td>1297614 A</td> <td>30-05-2001</td> </tr> <tr> <td>DE</td> <td>69915613 D1</td> <td>22-04-2004</td> </tr> <tr> <td>DE</td> <td>69915613 T2</td> <td>05-01-2005</td> </tr> <tr> <td>EP</td> <td>1078468 A1</td> <td>28-02-2001</td> </tr> <tr> <td>JP</td> <td>2002512469 T</td> <td>23-04-2002</td> </tr> <tr> <td>SE</td> <td>511428 C2</td> <td>27-09-1999</td> </tr> <tr> <td>SE</td> <td>9801367 A</td> <td>27-09-1999</td> </tr> <tr> <td>TW</td> <td>418567 B</td> <td>11-01-2001</td> </tr> <tr> <td>US</td> <td>6218976 B1</td> <td>17-04-2001</td> </tr> </table>	AU	4178299 A	08-11-1999	CA	2329119 A1	28-10-1999	CN	1297614 A	30-05-2001	DE	69915613 D1	22-04-2004	DE	69915613 T2	05-01-2005	EP	1078468 A1	28-02-2001	JP	2002512469 T	23-04-2002	SE	511428 C2	27-09-1999	SE	9801367 A	27-09-1999	TW	418567 B	11-01-2001	US	6218976 B1	17-04-2001
AU	4178299 A	08-11-1999																																		
CA	2329119 A1	28-10-1999																																		
CN	1297614 A	30-05-2001																																		
DE	69915613 D1	22-04-2004																																		
DE	69915613 T2	05-01-2005																																		
EP	1078468 A1	28-02-2001																																		
JP	2002512469 T	23-04-2002																																		
SE	511428 C2	27-09-1999																																		
SE	9801367 A	27-09-1999																																		
TW	418567 B	11-01-2001																																		
US	6218976 B1	17-04-2001																																		
WO 9904496	A	28-01-1999	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">EP</td> <td style="width: 40%;">0932936 A1</td> <td style="width: 50%;">04-08-1999</td> </tr> <tr> <td>TW</td> <td>425772 B</td> <td>11-03-2001</td> </tr> </table>	EP	0932936 A1	04-08-1999	TW	425772 B	11-03-2001																											
EP	0932936 A1	04-08-1999																																		
TW	425772 B	11-03-2001																																		