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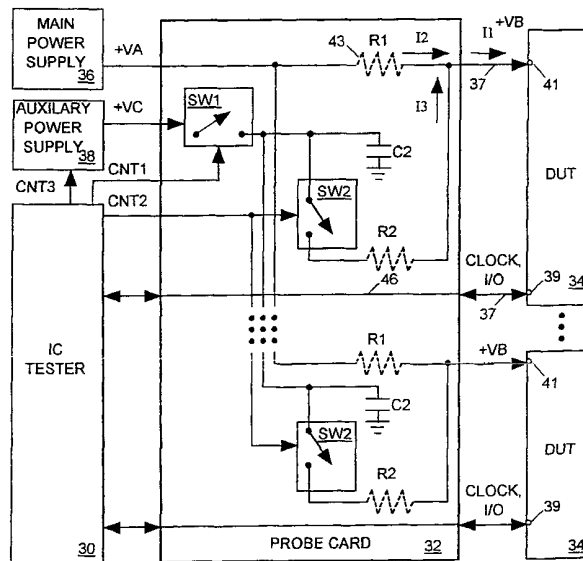
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- (88) Date of publication of the international search report: 25 April 2002

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.

(54) Title: APPARATUS FOR REDUCING POWER SUPPLY NOISE IN AN INTEGRATED CIRCUIT



(57) Abstract: A main power supply continuously provides a current to a power input terminal of an integrated circuit device under test (DUT). The DUT's demand for current at the power input terminal temporarily increases during state changes in synchronous logic circuits implemented within the DUT. To limit variation (noise) in voltage at the power input terminal arising from these temporary increases in current demand, a charged capacitor is connected to the power input terminal during each DUT state change. The capacitor discharges into the power input terminal to supply additional current to meet the DUT's increased demand. Following each DUT state change the capacitor is disconnected from the power input terminal and charged to a level sufficient to meet a predicted increase in current demand during a next DUT state change.

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INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/01955

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 H02M3/158 G01R31/30 G01R31/319		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 H02M G01R		
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, WPI Data, PAJ		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 422 562 A (ROBERT A.MAMMANO ET AL.) 6 June 1995 (1995-06-06) abstract figure 6 column 9, line 26 - line 40 ---	1,2
X	US 5 822 166 A (HAROLD L.MASSIE) 13 October 1998 (1998-10-13) abstract figure 2 column 1, line 28 - line 38 column 1, line 55 - line 64 column 2, line 40 - line 49 claims 1,2 --- -/--	1,2
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.		
<input checked="" type="checkbox"/> Patent family members are listed in 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 16 January 2002		Date of mailing of the international search report 28. 01. 2002
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Huyghe, E

## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/US 01/01955

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 502 671 A (JEFFREY E.KOELLING ET AL.) 26 March 1996 (1996-03-26) abstract figure 3 column 3, line 50 - line 60 ---	1
A	DE 32 34 004 A (CHRISTOPH EMMERICH GMBH) 15 March 1984 (1984-03-15) abstract page 8, line 7 -page 9, line 15 figures 1,2 ---	1
X	EP 0 893 876 A (HARRIS CORPORATION) 27 January 1999 (1999-01-27) abstract figure 3 ---	1,2
P,X	US 6 087 843 A (FERLAND MICHAEL R ET AL) 11 July 2000 (2000-07-11) column 2, line 1-35; figure 4 P,A column 5, line 9-38 ---	1,21,24 4,5,25, 26
A	US 5 652 524 A (FELL III JOSEPH H ET AL) 29 July 1997 (1997-07-29) figures 1,2 ---	9,11,14, 21-23
A	BAKER K ET AL: "PLUG-AND-PLAY IDDO TESTING FOR TEST FIXTURES" IEEE DESIGN & TEST OF COMPUTERS, IEEE COMPUTERS SOCIETY. LOS ALAMITOS, US, vol. 12, no. 3, 21 September 1995 (1995-09-21), pages 53-61, XP000541810 ISSN: 0740-7475 page 55, left-hand column, line 34 -page 57, right-hand column, line 7 ---	9,11,14, 21
A	"DEVICE TEST METHOD USING POWER SUPPLY CURRENT SIGNATURE COMPARISON" IBM TECHNICAL DISCLOSURE BULLETIN, IBM CORP. NEW YORK, US, vol. 34, no. 4A, 1 September 1991 (1991-09-01), pages 253-255, XP000210918 ISSN: 0018-8689 the whole document ---	17
A	US 5 592 077 A (PATEL KIRIT B ET AL) 7 January 1997 (1997-01-07) abstract ---	17
P,A	US 6 055 661 A (LUK FONG) 25 April 2000 (2000-04-25) abstract; figure 1 -----	17

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 01/01955

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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.:

### 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: 1-3, 6-8, 24

An apparatus for limiting variation in power supply voltage, using charging of a buffer capacitor to a voltage as a function of the transient load-current demands during next state change.

2. Claims: 4, 5, 9, 10-16, 21-23, 25

An apparatus for limiting variation in power supply voltage, with charging means for charging a buffer capacitor in between transient current events in a load and for disconnecting the charging means from the buffer capacitor during transient loading.

3. Claims: 17-20

An apparatus for testing an integrated circuit device under test, with an apparatus for testing an integrated circuit device under test involving an integrated circuit tester generating a sequence of test signals being used to cause the device under test to undergo a sequence of state changes.

4. Claim : 26

A method for supplying current to a power input terminal, using a data sequence being converted by an A/D-converter into a signal for controlling the impedance of a path between a buffer capacitor and a load.

INTERNATIONAL SEARCH REPORT

Information on patent family members

In International Application No  
PCT/US 01/01955

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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