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(54) Title: FREQUENCY RESPONSIVE BUS CODING

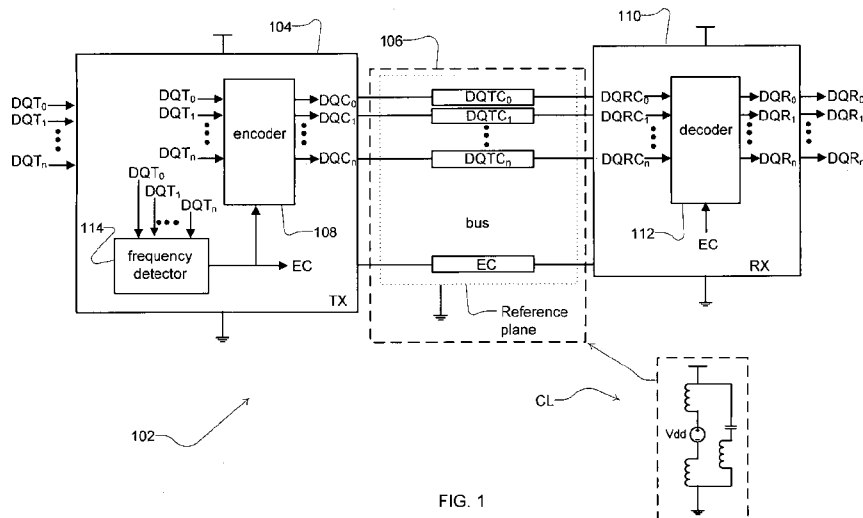
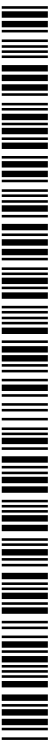


FIG. 1

(57) Abstract: A data system (102) permits bus encoding based on frequency of the bus, an encoding scheme may be implemented to avoid undesirable frequency conditions such as a resonant condition that may lead to degradation in system performance. The device or integrated circuit will typically include an encoder; in one embodiment, the encoder is a data bus inversion (DBI) circuit that selectively inverts all lines of a data bus. A detector that may include a band-pass or stop-band filter that, for example, evaluates data for transmission on the bus to detect frequency, for example, a predetermined frequency or a frequency range. The detector provides a control signal for the encoder to selectively apply an encoding scheme as a function of frequency.



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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, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 215 245 A (BELLISIO JULES A [US]) 29 July 1980 (1980-07-29) abstract column 2, line 20 - column 3, line 16; figure 2	1, 2, 14, 22-24, 28, 33, 34, 36, 42-44, 49, 57
X	US 2002/008647 A1 (VON WENDORFF WILHARD CHRISTOPH [DE]) 24 January 2002 (2002-01-24) paragraph [0001] - paragraph [0004] paragraph [0048]	1-59
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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 Koukourlis, Sotirios
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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 2004/124715 A1 (HUANG MINGWEI [US] ET AL) 1 July 2004 (2004-07-01) paragraph [0042] - paragraph [0044] paragraph [0046] - paragraph [0048] -----	1-59
A	US 2007/074055 A1 (MCCALL JAMES A [US] ET AL) 29 March 2007 (2007-03-29) abstract paragraph [0014] -----	1-59
A	STAN M R ET AL: "BUS-INVERT CODING FOR LOW-POWER I/O" IEEE TRANSACTIONS ON VERY LARGE SCALE INTEGRATION (VLSI) SYSTEMS, IEEE SERVICE CENTER, PISCATAWAY, NJ, US LNKD-DOI:10.1109/92.365453, vol. 3, no. 1, 1 March 1995 (1995-03-01), pages 49-58, XP000500301 ISSN: 1063-8210 the whole document -----	1-59

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2009/003697

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4215245	A	29-07-1980	NONE
US 2002008647	A1	24-01-2002	DE 10033130 A1 31-01-2002 EP 1170914 A2 09-01-2002
US 2004124715	A1	01-07-2004	NONE
US 2007074055	A1	29-03-2007	CN 101273322 A 24-09-2008 DE 112006002608 T5 21-08-2008 GB 2442410 A 02-04-2008 WO 2007041151 A2 12-04-2007