Method and apparatus for shifting at-speed scan patterns in a scan-based integrated circuit

Abstract:
A method and apparatus for time-division demultiplexing and decompressing a compressed input stimulus (421), provided at a selected data-rate R1 (421), into a decompressed stimulus (424, 426, 433, 435), driven at a selected data-rate R2 (442), for driving selected scan chains in a scan-based integrated circuit (401). The scan-based integrated circuit (401) contains a high-speed clock CK1 (443), a low-speed clock CK2 (442), a plurality of scan chains (411), ..., (418), each scan chain comprising multiple scan cells coupled in series. The method and apparatus comprises using a plurality of time-division demultiplexors (TDDMs) (402, 403) and time-division multiplexors (TDMMs) (408, 409) for shifting stimuli (421) and test responses (444) in and out of high-speed I/O pads. When applied to the scan-based integrated circuit (401) embedded with one or more pairs of decompressors (404, 405) and compressors (406, 407), it can further reduce the circuit’s test time, test cost, and scan pin count.
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, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published: with international search report

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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

A. CLASSIFICATION OF SUBJECT MATTER
  IPC(7) : H04J 3/00
  US CL : 370/498
  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)
  U.S. : 370/375, 498, 503, 516, 517, 518, 535

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

  Electronic database consulted during the international search (name of data base and, where practicable, search terms used)
  Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 6,539,034 B1 (SHIMOSAKA) 25 March 2003, column 1-8.</td>
<td>1-77</td>
</tr>
<tr>
<td>A</td>
<td>US 6,151,336 A (CHENG et al) 21 November 2000, column 1-9.</td>
<td>1-77</td>
</tr>
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</table>

Further documents are listed in the continuation of Box C. See patent family annex.

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent published on or after the international filing date
- "L" document which may throw doubt 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

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Form PCT/ISA/210 (second sheet) (July 1998)
Continuation of B. FIELDS SEARCHED Item 3:
EAST
search terms: time division multiplexing, demultiplexing, clock