SH-3 WinCE engine

Jan Beutel, Tobias Bösch
Electronics Laboratory, ETH Zürich
Phone: +41-1-632 51 44
FAX: +41-1-632 12 10
e-mail: jbeutel@ife.ee.ethz.ch

3rd February 1999

Abstract
A low power multichip module based on Hitachis Super-H architecture SH-3 processor and Microsofts Windows CE operating system is developed. The platform is targeted as a PDA for operation with the GPS-MS1 platform supplied by µ-blox AG.
Contents

- WinCE Engine Capabilities
- WinCE Engine Description
- HDI Substrate Technology
- Marketsituation Packaging
- GPS Integration
- Outlook
Hitachi Super-H Prerequisites

- WinCE System on SH7709 processor and companion
- Components available in FBGA/CSP packages
- Ready made development platform supplied by Hitachi

- Flexible system design, supporting SRAM, ROM, EDO/SDRAM
- Companion chip with I/O and display controller
- Only few external components necessary
WinCE Engine Description

- **Components**
  - SH7709 processor
  - HD64461 companion
  - 2 * 32 MByte SDRAM
  - 2 * 16 MByte Flash
  - 64 MBit display EDO DRAM
  - Clocking
  - Reset chip
- **Power supply**
  - Single 3.3V
- **System I/O**
  - 200 pin, 0.5 mm pitch

J. Beutel, T. Bösch 3rd February 1999
System Layout

Form factor 96 x 35 mm, height 7.45 mm (left), 1.7 mm (right)
**HDI Substrate Technology**

- DYCOstrate rigid-flex microvia board
- High density build-up technology
- Blind and buried vias
- Exterior planes for stability and EMV
- Via-at-SMD to eliminate soldermask

- 70 µm line/space
- 250 µm outer layer vias
- 200 µm inner layer vias
- 500 µm min. ball/padpitch
## DYCOstrate: Flexible Microvia Boards

### Inner Layers

<table>
<thead>
<tr>
<th></th>
<th>typical</th>
<th>limit</th>
<th>leading edge</th>
</tr>
</thead>
<tbody>
<tr>
<td>conductor spacing</td>
<td>80</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>minimum via pad diameter</td>
<td>250</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>landing pad diameter</td>
<td>300</td>
<td>225</td>
<td>175</td>
</tr>
</tbody>
</table>

### Outer Layers

| minimum via pad diameter     | 300     | 250   | 200          |

### Thickness

| total thickness board        | 250     | 175-250 | 125-250     |
| dielectric separation layer  | 25-35   | 25-35   | >15         |

### Cost:

++ Amount of layers, feature sizes, overall size

- ○ Plasma Vias
- - High density

---

J. Beutel, T. Bösch  3rd February 1999  7
Flex Circuit Advantages

- Adaptable form factor
- Long and slim vs. square and cube sized
- Bend radius < 2 mm
- Flex zone can be adapted
- Stacked components/modules
- 7.45 mm (bent 9.15 mm) overall height
External Connection

- 200 pins necessary for PCMCIA support and system bus
- 0.5 mm vs. 0.635 mm pitch results in double area
- Ultra fine pitch connectors cut down in cost

- Small pitch increases complexity in daughterboard
- Long connectors (> 100 pin) result in planarity problems
- Alignment problem for multiple connectors

- Twin connectors available as mounting bracket assembly
Marketsituation Memory Packaging

- Market is application/volume driven
- Workstation vendors dictate JEDEC norm for DRAM
- EDO RAM will be discontinued

- Flash and SRAM memory available in FBGA/μBGA
- All vendors have advanced packages available
- New packages are only applied to new products
- Fast RAMBUS, RDRAM, 256 Mbit SDRAM in Q3/Q4/99
Two distinct modules
- All GPS functionality runs on the GPS MS1
- Userinterface runs on the SH-3
- Future GPS chipset allows for further integration without SH-1
GPS Integration 2

- Query GPS data through serial interface
- Update GPS firmware through SH-7709
- Feed differential GPS data through the connector
- OR-gate allows use of advanced power modes of GPS-MS1
- Individual power down modes
A Typical PDA Board Compared
Outlook

- Components available in sample quantities now
- Production of 20 prototype boards
- Adaption of software from reference platform and test
- Future companion chip will incorporate display memory
- DRAM memory packages will be even smaller (BOC, BLP, FBGA...)
- Next generation Hitachi/GPS chipset allow further integration
- Adaption of form factor and I/O to OEM customer needs
- Series Production