tRAS Lock-out
& Concurrent Auto-Precharge

2002. 11. 19

Memory division
Add flag for Concurrent Auto Precharge to DDR SPD

Subject:
trAS Lock-out(Fast Auto Precharge) & Concurrent Auto Precharge

Background:
Both Concurrent Auto precharge and trAS lock-out are supported by all of the SAMSUNG’s DDR SDRAM devices. But, Current DDR SPD specifications do not permit support of trAS lock-out & concurrent auto-precharge. This feature, however, is beneficial to many markets including the server market. Presented at the January 2001 JEDEC meeting, then approved to ballot, this recommends adding a bit to the DDR SPD to indicate support of this function. So, SAMSUNG will apply this description to DDR SPD to new device.
What are the tRAS lock-out(Fast A/P) & Concurrent A/P

- tRAS lock-out
  : If a read with auto-precharge command is initiated, the DDR SDRAM automatically enters the precharge operation BL/2 clock later from a read with auto-precharge command when tRAS(min) is satisfied. If not, the start point of precharge operation will be delayed until tRAS(min) is satisfied.

- Concurrent Auto Precharge
  : If read command entered during the auto-precharge operation,
    Then, auto-precharge is canceled and execute reading.
    Precharge operation is delayed after that.
Timing for tRAS Lock-out

@ DDR266, CL=2

- tRCD (min) = 3 CLK
- tRAS (min) = 6 CLK
- Auto precharge starts after tRAS(min) is satisfied
- BL/2 from Read
- A/P After tRAS(min) is satisfied

The Leader in Memory Technology
Timing for Concurrent Auto Precharge

@ DDR266, CL=2

tRP(min) = 3CLK

A/P start point of Ra CMD but, A/P is canceled caused by new Read command. (Ra)

Begin A/P

Out Out Out Out Out Out Out Out
### DDR SPD 22Byte Change

#### 22byte : DDR SDRAM Device Attributes - General

**Old JEDEC (Aug., 1999)**

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5 ~ Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>TBD</td>
<td>...</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0 or 1</td>
</tr>
</tbody>
</table>

**New JEDEC (Jan., 2001)**

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5 ~ Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports Fast AP:</td>
<td>Concurrent Auto Precharge:</td>
<td>has no difference</td>
</tr>
<tr>
<td>0 = tRAP is tRAS</td>
<td>0 = Not supported</td>
<td></td>
</tr>
<tr>
<td>1 = tRAP is tRCD</td>
<td>1 = Supported</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0 or 1</td>
</tr>
</tbody>
</table>

- All of the Samsung’s DDR SDRAM devices can support tRAS lock-out & Concurrent Auto Precharge.