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VERIFICATION STRATEGY:

* **TESTCASES**:

/// description of testcases and their results and screenshots

**FUNCTIONAL** **COVERAGE**:

Implemented functional coverage to verify how much of design specifications has been covered by different testcases. Different covergroups, coverpoints and cross coverage are defined for inputs and outputs to cover all valid possible combinations of them using testcases.

**Coverpoints for input signals:**

**Cov\_rst:** Coverpoint which defines all valid bins of reset signal.

**Cov\_start:** Coverpoint which defines the valid bins when a host initiates a valid operation.

**Cov\_sel:** Coverpoint which covers all possible values of Data buffer clock enable signal.

**Cov\_we:** Defines the coverpoint for write enable signal.

**Cov\_ad:** Defines the bins for valid range of Data buffer address signal.

**Cov\_rwa:** Defines the different bins of different valid ranges of row address (all zeros, all ones, and different intermediate ranges) which is sent to the flash memory.

**Cov\_din:** Defines the bins for valid input data that has to be written to the flash memory.

**Cov\_cmd:** Different bins for all valid command signals, occurrence of multiple writes, reads that are performed on flash memory are defined.

**Cov\_illegalcmd:** Unused commands are defined as illegal bins which are excluded from coverage statistics.

**Cross Coverage of input cover points:**

**Cmd\_strt:** Cross coverage defined between coverpoint valid command (cov\_cmd) and coverpoint of start signal (cov\_start) to cover all whether a start signal has asserted for a valid command.

**Cmd\_sel:** Cross coverage defined between coverpoints of valid command (cov\_cmd) and clock enable signal (cov\_sel) to verify whether enable signal is asserted for a valid command.

**Cmd\_we:** Cross coverage to cover the cases for a write and read command (cov\_cmd), write enable is asserted or de-asserted(cov\_we).

**We\_sel:** Covers all cases when a write enable signal (cov\_we) is asserted or de-asserted, corresponding select signal(cov\_sel) is high or low.

**Ad\_we:** Checks whether all valid address ranges defined in address coverpoint(cov\_ad) are covered when a write or read operation(cov\_we) is performed.

**We\_rwa:** Includes all valid cross coverage bins for all valid row address’s (cov\_rwa)when write or read operation (cov\_we) is performed.

**Cmd\_rwa:** Includes all possible cross bins for all valid commands(cov\_cmd) and valid row address range(cov\_rwa).

**Cmd\_ad:** Bins for all valid commands (cov\_cmd) and valid data buffer address range (cov\_ad) are defined.

**Coverpoints for output signals:**

**Cov\_dou:** Covers all the valid data output when a read operation is performed on flash memory.

**Cov\_DIO**: Covers all the valid input and output data ranges when a page program (write) or page read operation is performed.

**Cov\_done:** Valid output response signal bins are defined whether an operation is completed or not.

**Cov\_PErr:** Covers the bins for page error signal if an error occurs during page program operation.

**Cov\_EErr:** Covers the bins for erase error signal if an error occurs during erase operation.

**Cov\_RErr:** Covers the bins for page read error signal if an error occurs during page read operation.

The following table shows all the coverpoints covered for implemented testcases.

|  |  |
| --- | --- |
| **Functional Testcase** | **COVERPOINT** |
| Basic command-response protocol | Cov\_cmd, cov\_start, cov\_done |
| Reset command operation | Cov\_rst, cov\_cmd |
| Write command operation | Cov\_cmd, cov\_we |
| Read command operation | Cov\_cmd, cov\_we |
| Erase command operation | Cov\_cmd |
| Valid commands | Cov\_cmd |
| Valid Address (row address, page) | Cov\_ad, cov\_rwa |
| Valid Input Data | Cov\_din |
| Invalid commands | Cov\_illegalcmd |
| Valid Command and start signal | Cross coverage of cov\_cmd, cov\_start (cmd\_strt) |
| Start signal and clock enable(sel) | Cross coverage of cov\_start, cov\_sel (strt\_sel) |
| Valid command and clock enable(Sel) | Cross coverage of cov\_cmd, cov\_sel (cmd\_sel) |
| Write & read enable and clock enable(sel) | Cross coverage of cov\_we cov\_sel (we\_sel) |
| Valid address and valid command | Cross coverage of cov\_ad, cov\_cmd (cmd\_ad) |
| Valid write enable and valid row address | Cross coverage of cov\_we, cov\_rwa (we\_rwa) |
| Valid output data | Cov\_DIO, cov\_dou |
| Valid Page error, Erase error, read error | Cov\_PErr, cov\_EErr, cov\_RErr |

// screen shots of coverage statistics