ABSTRACT

An operating method of a storage device including a memory controller and a non-volatile memory, the method including: performing a first read in response to a read request by reading data from the non-volatile memory using a default read voltage set; and performing a second read when the first read fails, by calculating a degradation compensation level, using a weight table, offset table, and displacement level, calculating a history read voltage set by performing an operation on the default read voltage set and degradation compensation level, and reading the data using the history read voltage set, wherein the weight table includes weights preset according to word line groups and state read voltages, the offset table includes offset levels preset according to the word line groups and the state read voltages, and the displacement level corresponds to a difference between a default read voltage level and an optimal read voltage level.

FIG. 1