ABSTRACT

A semiconductor device includes: circuit devices on a first substrate; a lower interconnection structure electrically connected to the circuit devices; a lower bonding structure connected to the lower interconnection structure; an upper bonding structure on the lower bonding structure; an upper interconnection structure connected to the upper bonding structure; a second substrate on the upper interconnection structure; gate electrodes between the upper interconnection structure and the second substrate; channel structures penetrating the gate electrodes and each including a channel layer; via patterns on the second substrate; a source contact plug spaced apart from the second substrate on an external side of the second substrate and having an upper surface higher than the second substrate and a lower surface lower than a lowermost gate electrode; and a source connection pattern contacting upper surfaces of each of the via patterns and the upper surface of the source contact plug.

FIG. 2