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(54) **TERNARY LOGIC ELEMENT AND
TERNARY LOGIC SYSTEM INCLUDING
SAME**

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(57) **ABSTRACT**

A ternary logic element including a transistor and a switching element. The transistor includes a channel layer including silicon, an input electrode, an output electrode, and a control electrode. The switching element includes an emitter, a base extending from the emitter, and a collector extending from the base. When a first control voltage is applied to the control electrode, the ternary logic element outputs a first voltage, and when a second control voltage different from the first control voltage is applied to the control electrode, the ternary logic element outputs a second voltage different from the first voltage, and when a third control voltage different from the first control voltage and the second control voltage is applied to the control electrode, the ternary logic element outputs a third voltage different from the first voltage and the second voltage.

