

between devices. To solve the problem, Patent Literature 1 discloses setting a size S of a channel region in the scanning direction of the pulse laser and the scanning pitch P of the pulse laser so as to satisfy substantially $S=nP$ (where n is an integer except 0), and so that crystalline distribution of a crystalline Si film has a pattern which periodically changes in the scanning direction of a pulse laser light, and the crystalline Si films in channel regions of the respective thin film transistors have the same periodical change in the pattern of the crystalline distribution.

Citation List

Patent Literature

[0004]

Patent Literature 1: Japanese Patent Laid-Open No. 10-163495

Summary of Invention

[0004a]

In the first aspect of the invention, a manufacturing method of a crystalline semiconductor film in which scanning is relatively performed on a non-single crystalline semiconductor film with a pulse laser shaped into a line beam shape having a flat portion in a shape of a beam cross-section in a beam short axis direction, the pulse laser having a beam short axis width of 100 to 500 μm , so that the pulse laser is made to move for each pulse, and the non-single crystalline semiconductor film is irradiated by the pulse laser

with a number of times of irradiation (n) in an overlapped manner, wherein

the flat portion has an energy intensity which is 96% or higher of maximum energy intensity,

a channel length of a transistor formed on the semiconductor film is (b) ~~(100 μm or less)~~ 6 to 40 μm ,

the pulse laser has irradiation pulse energy density (E) lower than irradiation pulse energy density at which fine crystallization occurs at the non-single crystalline semiconductor film by irradiation with the pulse laser and at which crystal grain size growth is saturated by a plurality of times of irradiation,

the number of times of irradiation (n) with the pulse laser is set at (n0-1) or greater when the number of times of irradiation at which the crystal grain size growth is saturated by irradiation with the pulse laser having the irradiation pulse energy density E is n0, and

a scanning direction of the pulse laser is a channel length direction of the transistor, and an amount of movement (c) for each of the pulses is set at less than (b).

Technical Problem

[0005]

However, controlling a scanning pitch to be an integral multiple in accordance with a size of a channel region is difficult in terms of accuracy, and, if it is tried to realize an apparatus which performs scanning at high accuracy, the apparatus cost rises drastically.

Claims

[Claim 1]

A manufacturing method of a crystalline semiconductor film in which scanning is relatively performed on a non-single crystalline semiconductor film with a pulse laser shaped into a line beam shape having a flat portion in a shape of a beam cross-section in a beam short axis direction, the pulse laser having a beam short axis width of 100 to 500 μm , so that the pulse laser is made to move for each pulse, and the non-single crystalline semiconductor film is irradiated by the pulse laser with a number of times of irradiation (n) in an overlapped manner, wherein

the flat portion has an energy intensity which is 96% or higher of maximum energy intensity,

a channel length of a transistor formed on the semiconductor film is (b) 6 to 40 μm ~~(100 μm or less)~~,

the pulse laser has irradiation pulse energy density (E) lower than irradiation pulse energy density at which fine crystallization occurs at the non-single crystalline semiconductor film by irradiation with the pulse laser and at which crystal grain size growth is saturated by a plurality of times of irradiation,

the number of times of irradiation (n) with the pulse laser is set at (n0-1) or greater when the number of times of irradiation at which the crystal grain size growth is saturated by irradiation with the pulse laser having the irradiation pulse energy density E is n0, and