CLAIMS

1. A method of dicing a semiconductor wafer comprising a plurality of integrated circuits, the method comprising:

forming a mask above the semiconductor wafer, the mask comprising a layer covering and protecting the integrated circuits;

patterning the mask with a split shaped laser beam laser scribing process to provide a patterned mask with gaps, exposing regions of the semiconductor wafer between the integrated circuits, wherein the split shaped laser beam laser scribing process comprises a one-to-two split beam running at approximately 800kHz with an approximately 6μj pulse energy per split beam and an approximately 800mm/sec stage speed; and

plasma etching the semiconductor wafer through the gaps in the patterned mask to singulate the integrated circuits.

2. The method of claim 1, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a symmetrically split laser beam.

3. The method of claim 1, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with an asymmetrically split laser beam.

4. The method of claim 1, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a line shaped flat top beam profile.

5. The method of claim 1, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a femto-second based laser beam.

6. The method of claim 1, wherein patterning the mask with the laser scribing process comprises forming trenches in the regions of the semiconductor wafer between the integrated circuits, and wherein plasma etching the semiconductor wafer comprises extending the trenches to form corresponding trench extensions.

7. The method of claim 6, wherein each of the trenches has a width, and wherein each of the corresponding trench extensions has the width.

8. The method of claim 1, further comprising:

subsequent to patterning the mask with the split shaped laser beam laser scribing process and prior to plasma etching the semiconductor wafer through the gaps, cleaning the exposed regions of the semiconductor wafer with a plasma process.

9. A method of dicing a semiconductor wafer comprising a plurality of integrated circuits, the method comprising:

laser scribing the semiconductor wafer with a split shaped laser beam laser scribing process to singulate the plurality of integrated circuits, wherein the split shaped laser beam laser scribing process comprises a one-to-two split beam running at approximately 800kHz with an approximately 6μj pulse energy per split beam and an approximately 800mm/sec stage speed; and

subsequent to laser scribing the semiconductor wafer, performing a plasma-based cleaning operation to clean sidewalls of the singulated plurality of integrated circuits.

10. The method of claim 9, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a symmetrically split laser beam.

11. The method of claim 9, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with an asymmetrically split laser beam.

12. The method of claim 9, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a line shaped flat top beam profile.

13. The method of claim 9, wherein scribing with the split shaped laser beam laser scribing process comprises scribing with a femto-second based laser beam.