

CLAIMS

1. A method of dicing a semiconductor wafer comprising a plurality of integrated circuits, the method comprising: introducing a substrate supported by a substrate carrier into a plasma etch chamber, the substrate having a patterned mask thereon covering integrated circuits and exposing streets of the substrate, and the substrate carrier having a backside, wherein the substrate carrier comprises an outer tape frame and supporting dicing tape, and wherein the outer tape frame is thermally conductive; supporting at least a portion of the backside of the substrate carrier on a chuck of the plasma etch chamber; cooling substantially all of the backside of the substrate carrier, the cooling comprising cooling at least a first portion of the backside of the substrate carrier by the chuck, wherein cooling substantially all of the backside of the substrate carrier comprises cooling the tape frame and the substrate; and plasma etching the substrate through the streets to singulate the integrated circuits while performing the cooling substantially all of the backside of the substrate carrier; and wherein cooling substantially all of the backside of the substrate carrier, further comprises cooling the tape frame of the backside of the substrate carrier with a cooling concentric chuck ring surrounding the chuck.
2. The method of claim 1, wherein, during the plasma etching, the chuck is maintained at a temperature at least as low as approximately -10 degrees Celsius, and the cooling concentric chuck ring is maintained at a temperature approximately in the range of 0 to -10 degrees Celsius.
3. The method of claim 1, wherein the chuck has a supporting area at least as large as the backside of the substrate carrier, and wherein cooling substantially all of the backside of the substrate carrier comprises cooling substantially all of the backside of the substrate carrier with the chuck.
4. The method of claim 3, wherein, during the plasma etching, the chuck is maintained at a temperature at least as low as approximately -10 degrees Celsius.
5. The method of claim 1, wherein the dicing tape is disposed between the tape frame and a cooling concentric chuck ring surrounding the chuck, and between the substrate and the chuck.
6. The method of claim 1, wherein the dicing tape is disposed between the tape frame and the chuck, and between the substrate and the chuck.
7. The method of claim 1, wherein, during the plasma etching, a portion of a front side of the substrate carrier is protected by a shadow ring.
8. The method of claim 1, further comprising: forming the patterned mask with a laser scribing process.

9. A plasma etch chamber, comprising: a plasma source disposed in an upper region of the plasma etch chamber; a cooling chuck disposed below the plasma source, the cooling chuck for supporting a first portion of a substrate carrier; and a cooling concentric ring surrounding the cooling chuck, the cooling concentric ring for supporting a second portion of the substrate carrier, wherein, together, the cooling chuck and the cooling concentric ring are for cooling substantially all of a backside of the substrate carrier; further comprising a cooling concentric ring surrounding the cooling chuck, the cooling concentric ring supporting the tape frame, wherein, together, the cooling chuck and the cooling concentric ring are for cooling substantially all of a backside of the substrate carrier.

10. The plasma etch chamber of claim 9, wherein the cooling chuck is configured to be maintained at a temperature at least as low as approximately -10 degrees Celsius during plasma processing, and the cooling concentric chuck ring is configured to be maintained at a temperature approximately in the range of 0 to -10 degrees Celsius during plasma processing.

11. The plasma etch chamber of claim 9, further comprising: a shadow ring assembly configured to be positioned between the chuck and the plasma source during plasma processing.

12. The plasma etch chamber of claim 9, wherein the plasma etch chamber is housed in a cluster processing tool.

13. The plasma etch chamber of claim 9, wherein the cooling concentric ring and the cooling chuck together comprise a supporting area at least as large as the backside of the substrate carrier, the substrate carrier having an outer tape frame.

14. A plasma etch chamber, comprising: a plasma source disposed in an upper region of the plasma etch chamber; and a cooling chuck disposed below the plasma source, the cooling chuck for supporting and cooling substantially all of a backside of a substrate carrier, wherein the cooling chuck comprises a supporting area at least as large as the backside of the substrate carrier, the substrate carrier having an outer tape frame.

15. The plasma etch chamber of claim 14, wherein the cooling chuck is configured to be maintained at a temperature at least as low as approximately -10 degrees Celsius during plasma processing.

16. The plasma etch chamber of claim 14, further comprising: a shadow ring assembly configured to be positioned between the chuck and the plasma source during plasma processing.

17. The plasma etch chamber of claim 14, wherein the plasma etch chamber is housed in a cluster processing tool.