CLAIMS

1. An end effector for a substrate processing system, comprising:

a body including:

a first body portion configured to connect to a wrist of a robot;

a second body portion extending from the first body portion and including a first arm, a second arm, and a slot between the first arm and the second arm; and

a plurality of contact pads comprising:

N contact pads arranged on the second body portion adjacent to the first body portion, where N is an integer greater than two;

M contact pads arranged on distal ends of the first arm and the second arm, respectively, where M is an integer greater than one;

P contact pads, where P is an integer greater than one; and

Q contact pads, where Q is an integer greater than one,

wherein the P contact pads and the Q contact pads are located on the first arm and the second arm between the N contact pads and the M contact pads.

2. The end effector of claim 1, wherein the body includes (N+M+P+Q) cavities for receiving the plurality of contact pads.

3. The end effector of claim 1, wherein the N contact pads, the M contact pads, the P contact pads, and the Q contact pads are made of elastomer.

4. The end effector of claim 1, wherein the end effector is made of one or more materials comprising alumina (Al_2O_3), sapphire (Al_2O_3), silicon carbide (SiC), silicon nitride (SiN), aluminum nitride (AlN), graphite, and molybdenum (Mo).

5. The end effector of claim 1, wherein the end effector is made of alumina (Al_2O_3).

6. The end effector of claim 1, wherein N = 3 and wherein the N contact pads are spaced evenly from one another on the second body portion.

7. The end effector of claim 1, wherein N = 4 and wherein the N contact pads are spaced evenly from one another on the second body portion.

8. The end effector of claim 1, wherein the end effector has a thickness in a range from 0.070” to 0.090”.

9. The end effector of claim 1, wherein a height of the N contact pads and the M contact pads is greater than a height of the P contact pads and the Q contact pads.

10. The end effector of claim 1, wherein:

a height of the N contact pads and the M contact pads is in range from 0.015” to 0.060”; and

the height of the P contact pads and the Q contact pads is in range from 0.010” to 0.040”, and

the height of the N contact pads and the M contact pads is greater than the height of the P contact pads and the Q contact pads.

11. The end effector of claim 1, wherein the P contact pads and the Q contact pads are arranged along a circle having a first radius and the N contact pads and the M contact pads are arranged along a circle having a second radius that is greater than the first radius.

12. The end effector of claim 11, wherein a third radius of a substrate supported by the end effector is greater than the first radius and the second radius.

13. The end effector of claim 1, wherein the first body portion has a first thickness, and the second body portion has a second thickness less than the first thickness.

14. A substrate delivery system for a substrate processing chamber, comprising:

a robot including a wrist;

an end effector connected to the wrist and including a body, a first arm and a second arm extending from the body, and a plurality of contact pads configured to support a substrate above the body;

a substrate support;

lift pins configured to extend above the substrate support and to retract;

a processing chamber including a chamber port; and

a controller configured to perform a first transfer sequence to deliver the substrate onto the substrate support, wherein the first transfer sequence includes:

causing the robot to load the substrate onto the end effector;

with the lift pins retracted, causing the robot to pass the substate and the end effector through the chamber port to a location above the substrate support;

causing the lift pins to extend;

causing the end effector to lower the substrate onto the lift pins; and

causing the robot to withdraw the end effector through the chamber port.

15. The substrate delivery system of claim 14, wherein:

the processing chamber further includes a chamber liner including a chamber liner slot,

the controller is configured to:

pass the substate and the end effector through the chamber port and the chamber liner slot to the location above the substrate support; and

remove the end effector through the chamber port and the chamber liner slot.