CLAIMS

1. A system for analysis of a device under test (DUT), comprising:

a test bench to support the DUT;

a heat source position to deliver a prescribed amount of energy to a localized spot on the DUT from one side thereof;

a thermal imaging system positioned so as to image the other side of DUT; and,

a controller activating said heat source to deliver the prescribed amount of energy and receiving output signal from said thermal imaging system.

2. The system of claim 1, wherein said heat source comprises a light source.

3. The system of claim 2, wherein said light source is a laser light source.

4. The system of claim 2, wherein said controller activates the light source at a lock-in frequency $f1$, and activates the thermal imaging system at a lock-in frequency $f2$.

5. The system of claim 4, wherein lock-in frequency $f2$ is at least four times higher than lock-in frequency $f1$.

6. The system of claim 5, wherein said thermal imaging system comprises an infrared camera.

7. The system of claim 6, wherein said heat source further comprises:

a movable stage;

an optical scanner coupled to the movable stage, said optical scanner receiving output of said light source and directing the output to a specified spot on the DUT; and,

an objective lens focusing the output onto a the specified spot on the DUT.

8. A system for analysis of a device under test (DUT), comprising:

a test bench to support the DUT;

a lock-in laser light source operating at a lock-in frequency $f1$ and position to deliver a pulsed laser light beam onto the DUT from one side thereof;

a lock-in thermal imaging system operating at a lock-in frequency $f2$ and positioned so as to image the other side of DUT; and,

a controller activating said heat source at the lock-in frequency $f1$ and activating said thermal imaging system at the lock-in frequency $f2$.

9. The system of claim 8, wherein the controller outputs a lock-in frequency $f1$ trigger signal to said lock-in laser light source and outputs a lock-in frequency $f2$ trigger signal to said lock-in thermal imaging system.

10. The system of claim 9, wherein lock-in frequency $f2$ is at least four times larger than lock-in frequency $f1$.

11. The system of claim 8, wherein the lock-in laser light source comprises:

an excitation source receiving said lock-in frequency $f1$ trigger signal and generating pulsed laser light beam;

a scan unit receiving and directing the pulsed laser light beam onto a defined location on the DUT; and,

an objective lens focusing the pulsed laser light beam onto the defined location.

12. The system of claim 11, wherein the lock-in thermal imaging system comprises an infrared camera.

13. A method for testing a device under test (DUT), comprising:

situating the DUT onto a test bench;

illuminating a defined spot on one side of the DUT;

obtaining a thermal image of the other side of the DUT; and,

analyzing the thermal image to thereby characterize the thermal propagation of heat within the DUT.

14. The method of claim 13, wherein illuminating a defined spot comprises delivering a series of laser light pulses at a frequency $f1$.

15. The method of claim 14, wherein obtaining a thermal image comprises obtaining a series of images at a frequency $f2$.

16. The method of claim 15, further comprising synchronizing frequencies $f1$ and $f2$.

17. The method of claim 16, wherein frequency $f2$ is at least four times higher than frequency $f1$.

18. The method of claim 14, further comprising focusing the series of pulses into a predefined depth within the DUT.

19. The method of claim 14, wherein the defined spot includes at least one through-silicon via (TSV), and further comprising comparing the thermal image to a reference thermal image to thereby investigate faults in the TSV.

20. The method of claim 14, further comprising assembling a reference database of thermal propagation of heat within various layers of the DUT.

The invention claimed is:

1. A system for analysis of a device under test (DUT), comprising:

a test bench to support the DUT;

a heat source position to deliver a prescribed amount of energy to a localized spot on the DUT from one side thereof wherein the defined spot includes at least one through-silicon via (TSV);

a thermal imaging system positioned so as to image the other side of DUT; and,

a controller activating said heat source to deliver the prescribed amount of energy by delivering a series of pulses at a frequency f**1** and receiving output signal from said thermal imaging system and comparing a thermal image from the thermal imaging system to a reference thermal image to thereby investigate faults in the TSV.

2. The system of claim **1**, wherein said heat source comprises a light source.

3. The system of claim **2**, wherein said light source is a laser light source.

4. The system of claim **2**, wherein said controller activates the light source at a lock-in frequency f**1**, and activates the thermal imaging system at a lock-in frequency f**2**.

5. The system of claim **4**, wherein lock-in frequency f**2** is at least four times higher than lock-in frequency f**1**.

6. The system of claim **5**, wherein said thermal imaging system comprises an infrared camera.

7. The system of claim **6**, wherein said heat source further comprises:

a movable stage;

an optical scanner coupled to the movable stage, said optical scanner receiving output of said light source and directing the output to a specified spot on the DUT; and,

an objective lens focusing the output onto a the specified spot on the DUT.

8. A system for analysis of a device under test (DUT), comprising:

a test bench to support the DUT;

a lock-in laser light source operating at a lock-in frequency f**1** and positioned to deliver a pulsed laser light beam onto the DUT from one side thereof onto a defined spot that includes at least one through-silicon via (TSV);

a lock-in thermal imaging system operating at a lock-in frequency f**2** and positioned so as to image the other side of DUT; and,

a controller activating said laser light source at the lock-in frequency f**1** and activating said thermal imaging system at the lock-in frequency f**2**, and comparing a thermal image from the thermal imaging system to a reference thermal image to thereby investigate faults in the TSV.

9. The system of claim **8**, wherein the controller outputs a lock-in frequency f**1** trigger signal to said lock-in laser light source and outputs a lock-in frequency f**2** trigger signal to said lock-in thermal imaging system.

10. The system of claim **9**, wherein lock-in frequency f**2** is at least four times larger than lock-in frequency f**1**.

11. The system of claim **8**, wherein the lock-in laser light source comprises:

an excitation source receiving said lock-in frequency f1 trigger signal and generating pulsed laser light beam;

a scan unit receiving and directing the pulsed laser light beam onto a defined location on the DUT; and,

an objective lens focusing the pulsed laser light beam onto the defined location.

12. The system of claim **11**, wherein the lock-in thermal imaging system comprises an infrared camera.

13. A method for testing a device under test (DUT), comprising:

situating the DUT onto a test bench;

illuminating a defined spot on one side of the DUT by delivering a series of laser light pulses at a frequency f1;

obtaining a thermal image of the other side of the DUT; and,

analyzing the thermal image to thereby characterize the thermal propagation of heat within the DUT; and,

wherein the defined spot includes at least one through-silicon via (TSV), and further comprising comparing the thermal image to a reference thermal image to thereby investigate faults in the TSV.

14. The method of claim **13**, wherein obtaining a thermal image comprises obtaining a series of images at a frequency f2.

15. The method of claim **14**, further comprising synchronizing frequencies f1 and f2.

16. The method of claim **15**, wherein frequency f2 is at least four times higher than frequency f1.

17. The method of claim **13**, further comprising focusing the series of pulses into a predefined depth within the DUT.

18. The method of claim **13**, further comprising assembling a reference database of thermal propagation of heat within various layers of the DUT.