Yamaichi Electronics Newsletter Issue Two

December 02, 2009

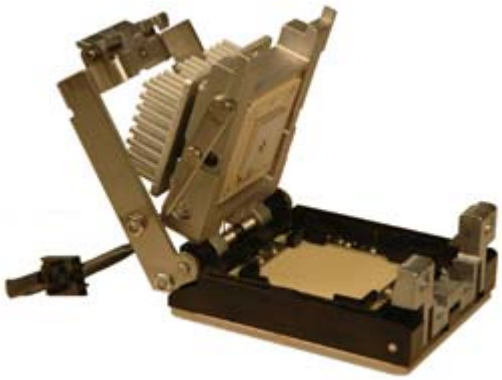
High Power Test and Burn-in Sockets

If you are doing functional testing or burn-in on high power graphics, processor, or RF devices you already know that maintaining the proper test temperature is key, but is also difficult to do. For large area array processor packages like BGA and LGA, power dissipation can be 40 watts or higher. During normal operation the device is generating internal heat which is generally dissipated by a heat sink and fan that is attached to the device once it is mounted onto the motherboard. However, during functional bench test the socket must control the device temperature.

In this case the socket is fitted with a finned heatsink that is part of the socket lid and makes contact to the device. The heatsink style and size is selected to meet the required dissipation wattage of the device, and work within the socket design parameters.

Above: Yamaichi BGA Test Contactor With Integral Heatsink and Fan

Burn-in test applications for processors often require that the device be held at a given temperature during the entire test time. There are specialized burn-in systems such as the MCC HPB-5B that have active control circuitry for each device position. Each device is individually monitored for temperature using a thermocouple embedded in the heatsink which makes contact to the package body. Heaters can be dded to the heatsink assembly to maintain the test temperature of the die.



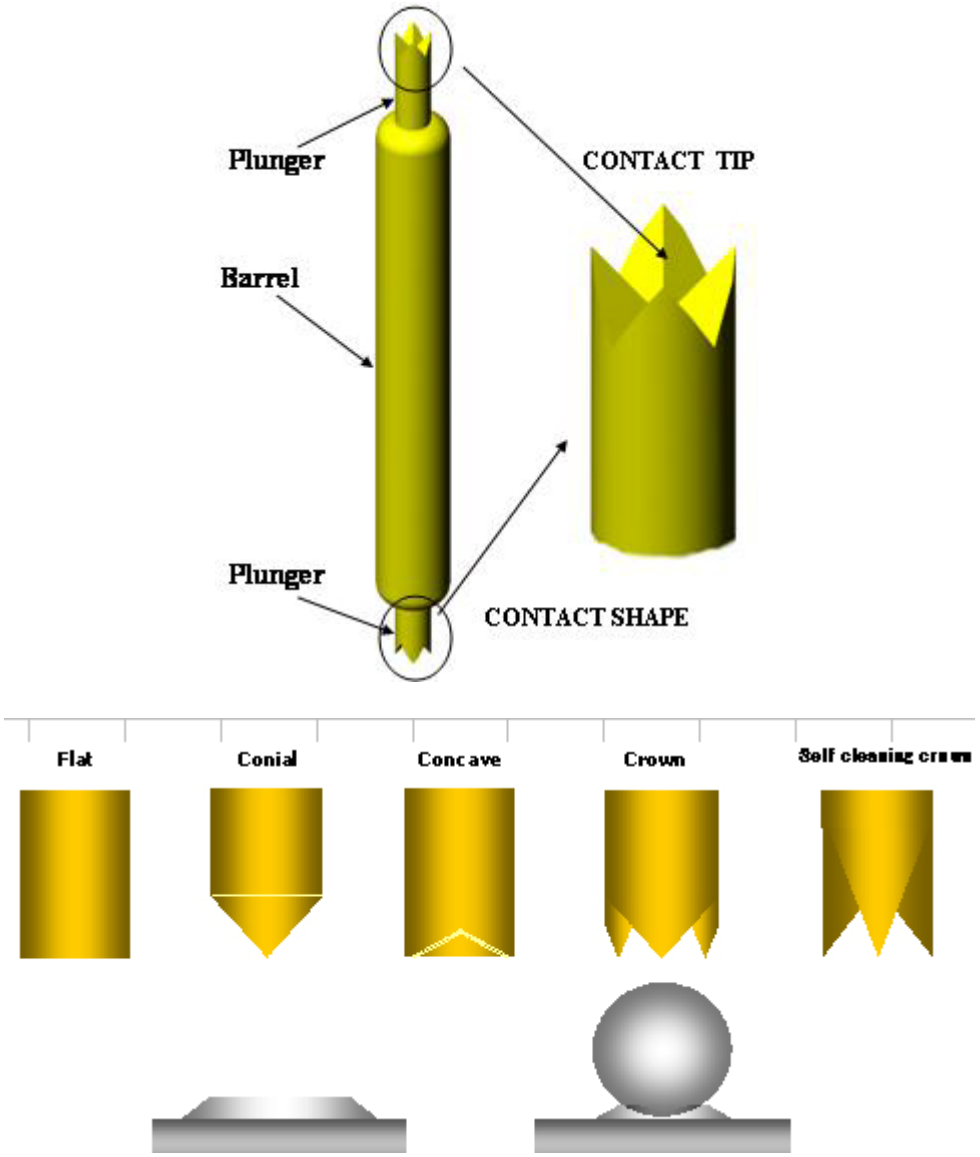
Above: Yamaichi IC530 Compression Mount High Power Burn-in Socket

Yamaichi offers test and burn-in sockets for use in high power applications. Our modular designs allow passive or active control of device temperature during test and can accommodate a wide variety of packages. Contact us today with your specific socket requirements.

Spring Pins

Spring probes, also known as contact pins or spring pins are one of the most popular contact types used to meet today's demanding semiconductor testing requirements. They are available in many different sizes and designs, are durable, reliable, and can accommodate a wide range of test applications and package types.

The components of a basic four-piece spring probe are the barrel, the upper and lower plungers, and the spring. The spring can be located either inside or outside the barrel, depending on the pin design. The lower plunger makes contact to a pad on the PC Board, and the upper plunger contacts the DUT. Contact tip styles are selected for the specific type of device being contacted and include crown, conical, and flat designs. Springs are made of either piano wire or stainless steel, and are designed to meet specific force, travel, and temperature requirements.



Upper plunger material is usually hardened beryllium copper, with barrels and lower plungers made of brass. The barrel and plungers are normally plated with hard nickel and then gold. The nickel acts as a solid base for the gold, which provides a low resistance contact surface to the PCB and DUT. Alternate upper plunger materials such as Palladium alloy and our new Conductive Super Hard Coating (CSH™) reduce contamination and solder/tin buildup, reduce cleaning cycles, and increase contact life. Typical uses for four-piece probes include device characterization and ATE final test.

Three-piece and two-piece probe designs are similar in performance to four-piece probes but are less costly to manufacture. The plunger and barrel are stamped / rolled as one piece rather than being separately machined or form drawn. Two-piece and three-piece probe designs are

used for high volume burn-in and test applications.

In the three-piece probe design the lower plunger is fixed, and only the upper plunger travels.

Three-piece Probe

1 - Upper Plunger/Barrel
2 - Spring
3 - Lower Plunger – fixed position after mounted on PCB

Two-piece probes do not have barrels, the spring acts as the barrel with the plunger held inside of it.

Two-piece Probe

Plunger and spring only

All spring probes provide a 1:1 vertical interface between the DUT and PCB, making it possible to use a similar pad footprint as a soldered-down device. This also allows for very fine pitch placement of the probes, such as for kelvin contact applications.

Package materials can affect pin CRES performance. In general, Pb Free materials are harder than standard eutectic materials and exhibit different oxidation characteristics, which affects pin contact resistance. Because Pb Free materials are harder, pin contact force is increased to compensate. With eutectic packaging a force of around 20 grams was acceptable, with Pb Free up to 35 grams of force is used. On Pb Free packages the oxidation barrier is also harder to break thru. Once the contamination sets on the pin crown it becomes difficult to remove and resistance rises. Lead is not very friendly to gold, but tin is friendly to gold, so cleaning becomes more important with Pb Free packaging. Alternate materials such as Palladium Alloy that are not friendly to tin or solder can be used for the pin upper plunger.

Yamaichi Electronics designs and manufactures standard and custom high quality spring probes for use in our test sockets for BGA, QFP, QFN, and many other IC packages.