

# Industry Developments:

## Smartphone Cooling Systems

When it comes to water and smartphones, the topic usually concerns how resistant a phone is to incidental water, or even to full immersion, e.g., in the bathtub. Today, however, water is being seen as more of an ally of reliable function because of its utility in cooling hot internal components.

With increasingly processor-intensive apps being used on mobile devices, the powerful chipsets in smartphones are running hotter than ever. Many desktop computers and larger, powerful computing systems use water cooling to keep their CPUs from overheating. Now, smaller versions of these cooling systems are being employed in warm smartphones.



Figure 1. NEC's Medias X 06E Smartphone

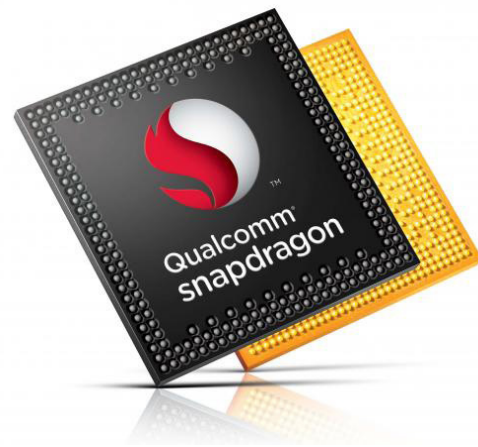


Figure 2. Qualcomm Snapdragon Processor [1]

One such example is the Medias X N-06E phone from NEC, the world's first water-embedded smartphone. At the heart of the Medias X N-06E is a quad-core Snapdragon S4 Pro SoC running at 1.7 GHz, that has its heat drawn away to the sides of the phone by a water-filled heat pipe. [1]

NEC's cooling scheme for the Qualcomm Snapdragon 600 quad-core SoC processor features a liquid-charged tube from the CPU to a heat-dispersing graphite radiator along the system board. [2]

The heat pipe in the NEC Medias X smartphone is only 0.6 mm in diameter, which is much thinner than similarly functioning pipes in notebook and

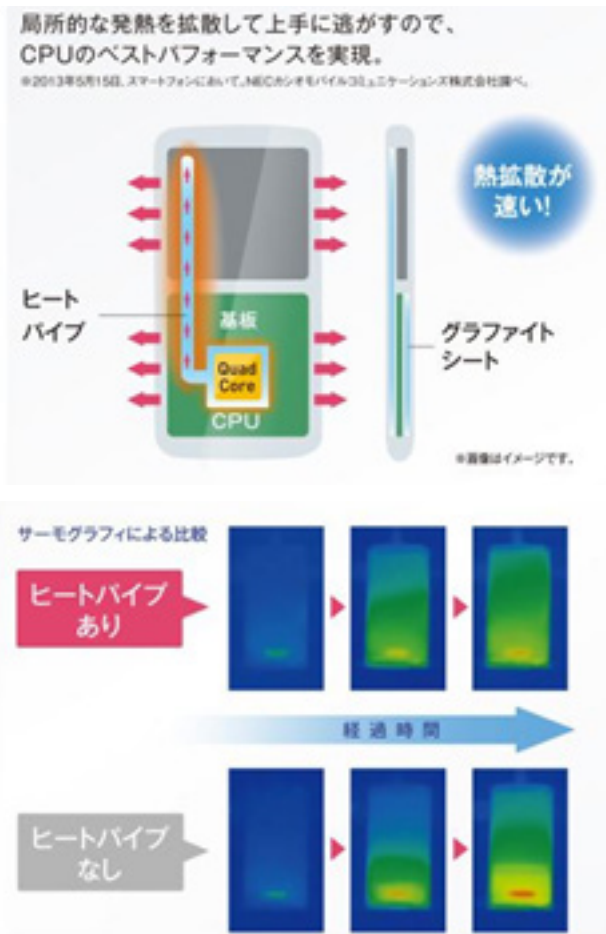


Figure 3. Illustration of Heat Pipe System for Cooling the NEC Medias Smartphone Processor [4]

desktop PCs. According to one source, while several OEMs can produce this narrow diameter heat pipe, current manufacturing methods can only provide a 30% production yield rate. [3]

The Snapdragon chip supports clocking up to 1.9 GHz, but NEC designates 1.7 GHz for the water-embedded phone. Thus, while the cooling may not offer improved performance, the cooler processor may have an extended life and also stay cooler to the touch when being held. The phone includes 2GB of RAM, and runs on the Android 4.2 mobile OS. It features a 4.7-inch 720 x 1,280 OLED display, a 13.1-megapixel camera, 2,300 mAh (milliamp hours) battery, and waterproof and dustproof casings.

While NEC was the first major smartphone company to launch a liquid-embedded smartphone, other manufacturers are likely to soon follow. According to some sources, a number of major smartphone makers including Apple, Samsung Electronics and HTC will launch their own liquid-embedded models before the end of 2013. [5-6]

One design hurdle is for the supplier industry to improve the yield on 0.6 mm heat pipes to meet the high volume needs of multiple new models. Consumer experience with the Medias should influence new designs as well, e.g., whether the cooling system remains water tight under constant handling.

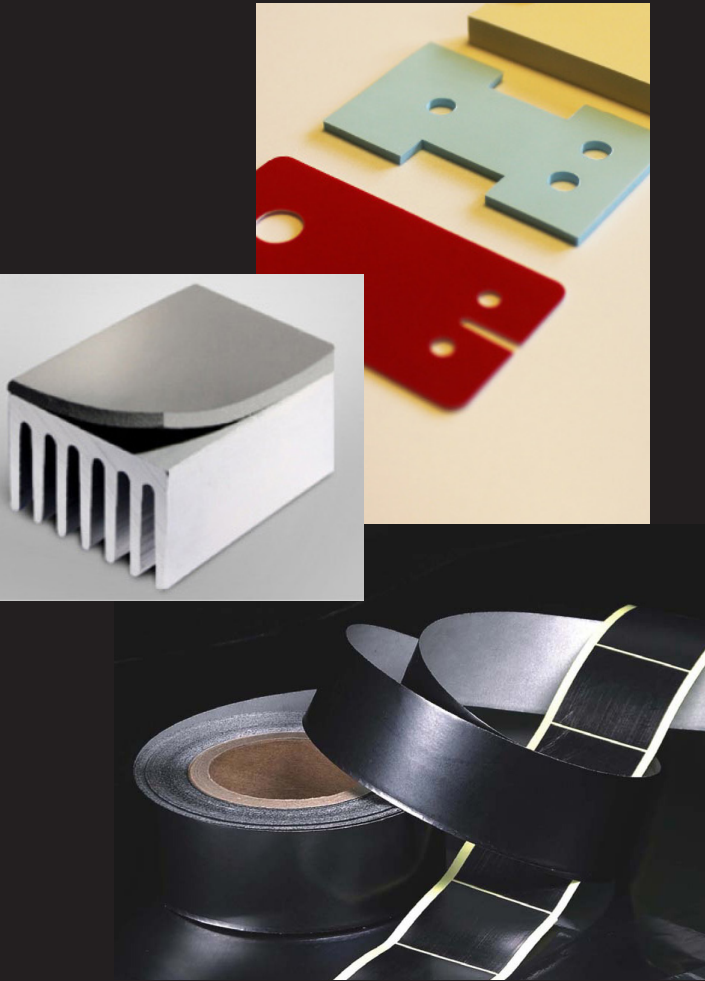
#### References:

1. Gizmag.com, <http://www.gizmag.com/nec-medias-x-n-06e-water-cooled-smartphone/27553/>
2. Engadget.com, <http://www.engadget.com/2013/05/15/necs-medias-x-smartphone-for-docomo-liquid-cooled/>
3. Abcnetspace.com, <http://www.abcnetspace.com/2013/06/future-smartphones-will-use-liquid-cooling-technology.html>
4. Vr-zone.com, <http://vr-zone.com/articles/smartphones-in-2014-might-come-with-water-cooled-heat-pipes/38622.html>
5. Cultofandroid.com, <http://www.cultofandroid.com/30250/apple-samsung-htc-to-release-liquid-cooled-smartphones-this-year-rumor/>
6. Thenewstribe.com, <http://www.thenewstribe.com/2013/06/22/samsung-galaxy-s5-apple-iphone-6-coming-with-liquid-cooling-technology/>
7. Qualcomm Inc., <http://www.qualcomm.com/>

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