TSMC DTC: Reverse Costing Analysis

Description: Thanks to TSMC, Integrated Passive Devices (IPD) are back in mobile industry. Information about the Apple A10 integrated in the latest flagship of the firm, the iPhone 7, mentioned the use of the first PoP Wafer Level Packaging for consumer developed by TSMC named iNFO-PoP (integrated Fan-Out – Package-on-Package). But for this occasion, TSMC also integrated a brand new technology that was never proposed for high volume product. For the A10 application processor, TSMC integrated High density deep trench capacitor (DTC) on silicon substrate as Land-Side decoupling capacitor.

Located under the inFO PoP, the Land-Side Capacitor (LSC) is in flip chip configuration and supported by an extra layer on the PCB.

The LSC is a high density deep trench capacitor on silicon substrate developed by TSMC using trench capacitor to increase the capacitive area without changing the footprint of the component. Compared to MLCC technology, TSMC marked a huge breaking point with a component that can compete with ceramic capacitor. In this report, we show the differences and the innovations of this capacitor: trench silicon, oxide deposition, ... The detailed comparison with the LSC in the Exynos 8 and the Snapdragon 820 will give the pro and the cons of the TSMC’s LSC technology.

Thanks to this DTC process, TSMC is able to propose a very thin capacitor, with a high density and same footprint as MLCC 0204. The result is a very cost-effective component that can compete with any ceramic capacitor. In the report, the cost comparison is also including in order to highlight the difference with ceramic capacitor.

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