

100V high capacitance value MLCC suggestion for 48V power systems

1210i, 10uF, 100V, X7S (CL32Y106KCVZNWE)



Abstract

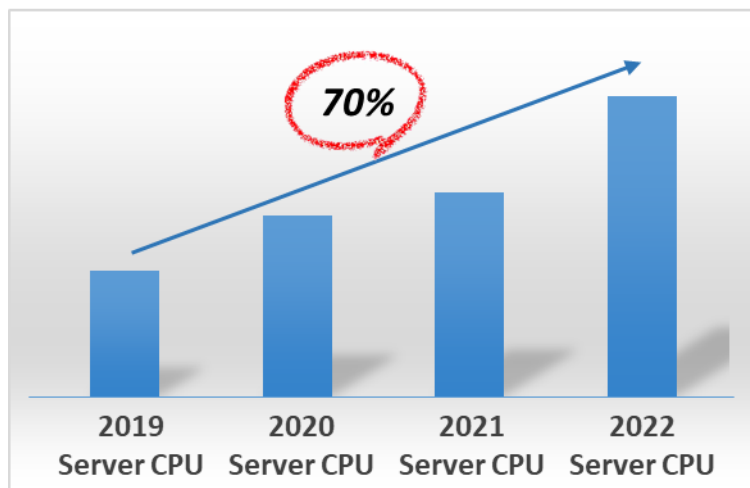
With the increase of power consumption of data centers, a resulting trend is the adoption of more 48V power systems. To support this growing demand of 48V power systems, Samsung Electro-Mechanics offers a 1210i, 10uF, 100V, X7S MLCC which operates under higher temperature conditions. In addition this MLCC is available for Industrial and robotics applications which are also using 48V power systems.

The Rise of TDP (Thermal Design Power) in CPU, Memory, GPU

The expansion of Artificial Intelligence (AI) driven by big data, data center companies are in need more processing power, increasing their need for processors with a higher number of CPU cores. The resulting TDP of server CPU's has increased more than 70% for the past 3 years and expects to reach 350~400W in '22 for new server CPU.

Additionally, memory module TDP is increasing with the faster speed offered by DDR5 and is also accelerating the consumption of power (See figure1).

[Server CPU TDP]



[Memory Module TDP]

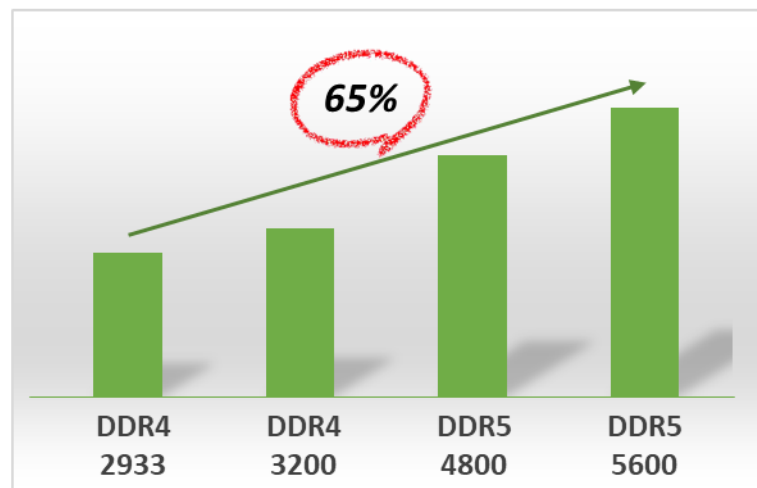


Figure1. Server CPU and memory module TDP trend

In other applications like Machine Learning, the TDP within GPU and Tensor hardware accelerator processor is also increasing, reaching almost 400W per processor.

Data center energy efficiency is not a currently a corporate problem, but a national issue. The US Department of Energy (DOE) is starting to distribute guidelines for improving data center energy efficiency.

Rank	Country	Consumption
1	China	7,500
2	United States	3,990
3	India	1,547
36	Finland	84
37	Belgium	82
-	US Data centers	73
38	Austria	67

According to the DOE, US based data centers consume 73 Billion kWh of electricity, ranked in the top 38 of 218 countries electricity consumption around the world. Equaling the total electricity consumed by countries such as Chile, Austria and Belgium. The power required for the operation of servers in data center's accounts for more than 50% of all their power consumption and is growing!

Figure2. List of countries by electricity consumption (Billion kWh, Source: Wikipedia)

Expansion of 48V power systems

Many data center companies are converting to 48V systems, realizing good power conversion efficiency, reducing their high power problems. is rapidly starting to trend with others to replace their existing 12V systems. From the server system designer's point of view, as the input voltage changes from 12V to 48V, this requires 100V high capacity MLCC to support.

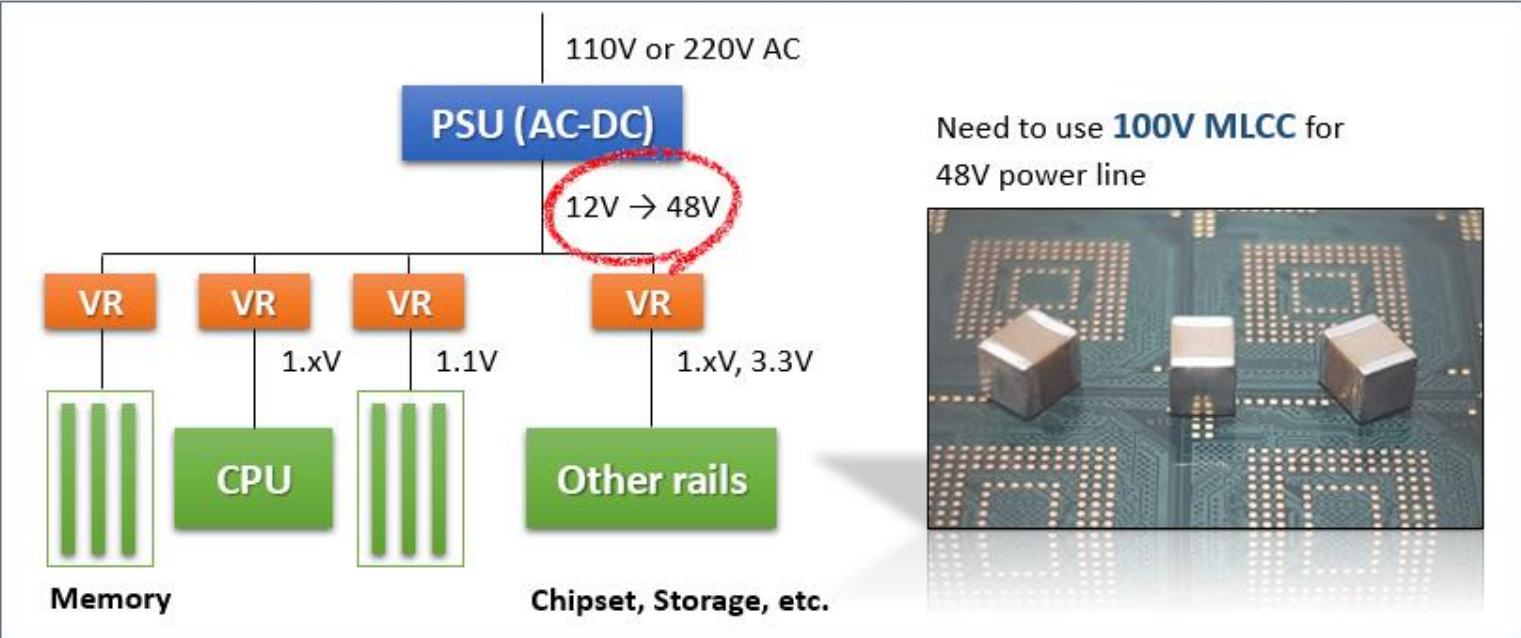


Figure3. 48V power delivery

Server system heat problem

Another issue plaguing the modern day server systems is the thermal issue. The number of CPU cores is rapidly increasing and accelerators, high-performance graphic cards are also added, so the heat problem is quickly expanding.

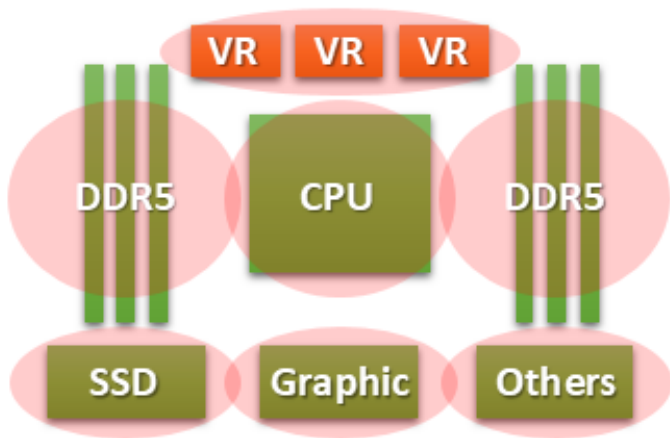


Figure4. Server system layout

Starting with Ice Lake, the number of DIMM modules that can be supported per CPU has increased from 12 to 16. As DDR5 now has its own onboard Voltage Regulator (VR) the heat inside the system is rapidly increasing.

The adoption of high-temperature characteristic MLCC's will be required.

Samsung 1210i, 10uF, 100V, X7S solution (CL32Y106KCVZNWE)

Samsung Electro-Mechanics, strategically targeting these customer problems has developed a 10uF, 100V, X7S MLCC that supports a high temperature of up to 125°C and guarantees better reliability than existing products for network equipment and corporate equipment such as servers. These products are available for purchase through DigiKey.

[DC-Bias Graph]

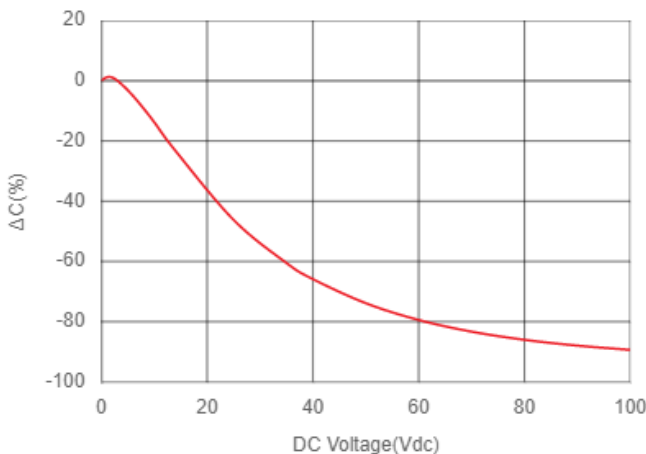


Figure5. CL32Y106KCVZNWE DC-Bias

[Reliability Condition]

	General	High Reliability *
Biased Humidity	40°C 95%RH	65°C 90%RH
High Temp. Load Test	Max Temp., 1.0Vr, 1000hr	Max Temp., 1.5Vr, 1000hr

Figure6. CL32Y106KCVZNWE reliability spec.

[Datasheet Download](#)

[Buy at DigiKey](#)

If you have a additional inquiry, Please contact to David Lee (joayou.lee@samsung.com)

Available for AI robotics and network

Applications that require high power such as warehouse robotics using AI, may have four 12V batteries connected in series and a 48V system is adopted. 48V power system are also used in network equipment, which makes it a good fit to use the high-reliability products from Samsung Electro-Mechanics.

