**Title: A Comprehensive Analysis of CPU and GPU Technological Trends in Semiconductor Progression**

**Data Visualisation Dashboard (Tableau):** <https://public.tableau.com/views/CPUandGPUPerformancesDataset/Dashboard1?:language=en-US&:display_count=n&:origin=viz_share_link>

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**Introduction:**

This report delves into the rapidly evolving landscape of semiconductor technology, examining trends in CPU and GPU development over time. It explores the relationships between process node reduction, transistor count escalation, and Thermal Design Power (TDP) evolution, shedding light on how these factors shape the performance and efficiency of processors.

**Data Analysis Tools Used:**

* Python
* Excel
* Tableau

**Python Code to Summarise Data and Count the Number of Blank Entries in Each Heading:**

*Code:*

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*Output:*

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**CPU Process Node and Transistor Count:**

The relentless pursuit of smaller process nodes and higher transistor counts has been a driving force in CPU innovation. The data reveals a consistent decrease in the average CPU process node size over time, indicating the industry's success in reducing transistor size. This reduction aligns with Moore's Law, reflecting an exponential increase in transistor count. AMD's aggressive adoption of TSMC's 7nm process node stands out, showcasing a strategic leap forward. This reduction, coupled with an increase in transistor count, not only signifies improved performance but also a more energy-efficient design. In contrast, Intel's fabs have encountered a lack of progress in process node reduction, stagnating at 14nm for several years, potentially hindering scalability and contributing to disparate TDP trends. However, despite process node constraints, Intel consistently enhances CPU performance through architectural innovations, showcasing commendable commitment and competitiveness.

**CPU TDP Trends:**

The correlation between CPU TDP trends and manufacturing is evident. As AMD embraces smaller process nodes, the resulting CPUs with higher transistor counts demonstrate improved computational capabilities and, when efficiently managed, enhanced energy efficiency. The divergence in TDP trends between AMD and Intel underscores the critical role of manufacturing strategy in achieving a balance between performance and power consumption.

**GPU Process Node and Transistor Count:**

Similar to CPUs, GPUs exhibit a relentless pursuit of smaller process nodes and increased transistor counts. The inclusion of ATI's GPUs in the analysis, post-acquisition by AMD in 2006, provides a comprehensive view of AMD's overall graphics technology evolution. Both AMD and NVIDIA GPUs align with the industry trend, showcasing advancements in manufacturing technology.

**GPU TDP Trends:**

The steady increase in GPU TDP over time reflects the industry's response to escalating consumer demands for graphics performance. Notably, NVIDIA GPUs have experienced a significant rise in TDP. AMD's post-acquisition period initially displayed a high TDP that gradually decreased before rising again, reflecting the delicate balance of power consumption and performance. The data suggests that, similar to CPUs, managing TDP in GPUs is intricately tied to advancements in manufacturing technology.

**Conclusion:**

The intricate interplay between CPU and GPU technological trends reveals the pivotal role of semiconductor manufacturing in shaping performance, efficiency, and power consumption. AMD's strategic adoption of smaller process nodes in CPUs and GPUs showcases a commitment to innovation, while Intel faces challenges in process node reduction. These dynamics underscore the need for a balanced approach to TDP management, aligning with consumer demands and technological advancements. As the semiconductor industry continues to evolve, monitoring these trends will be imperative for anticipating future advancements and staying competitive in the market.