



PowerWise® Adaptive Voltage Scaling (AVS) for 10GBE Applications

Adaptive Voltage Scaling (AVS)

Adaptive Voltage Scaling (AVS) technology is a real-time, continuous, closed-loop power management technology. The AVS technology enables optimized power delivery to processors, ASICs, and SoCs by adaptively optimizing supply voltages over process and temperature variations in order to maximize system-level energy savings.

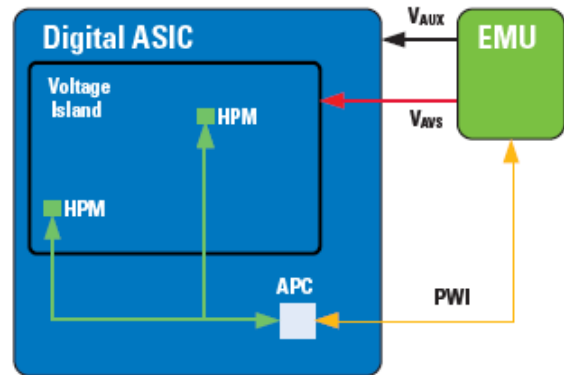
10Gigabit Ethernet (10GBE)

For next-generation network infrastructure, 10GBE is gaining wider adoption because of its improvements in bandwidth, scalability, latency, reliability, and overall performance. New applications in Ethernet Technology are creating demand for higher bandwidth and energy-efficiency in communications infrastructure equipment. Power consumption is one of the key drivers for deployment of datacenter network infrastructure. By enabling lower power consumption, implementation of a 10GBASE-T system becomes more compelling and more broadly applicable across a range of networking and computing equipment.

What AVS Can Do

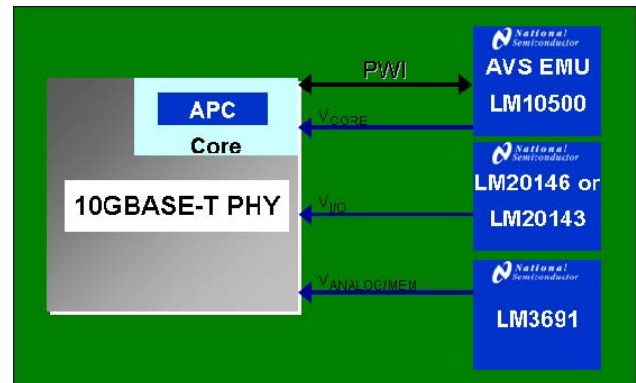
AVS technology is a system-level approach that reduces the power consumption of digital ASIC solution used in network infrastructure equipments by addressing the tradeoff between power and performance. The V_{DD} of the core must be high enough to support ever increasing clock rates. However, the higher V_{DD} , the more power that is dissipated by the processor. In fact, the power consumption is proportional to V_{DD}^2 , and even greater than this when considering leakage.

This power dissipation in turn requires larger heat sinking solutions. Even with the modern practice of voltage binning, considerable voltage headroom remains due to tester guardbands, temperature variation, and other inaccuracies. AVS eliminates these guardbands, and delivers exactly the voltage needed for a given performance through a closed loop determination of the optimally lowest voltage.



AVS Implementation in 10GBE

The HPM (Hardware Performance Monitor) and APC (Advance Power Controller) are embedded into the processor in order to monitor the process and temperature variation of the ASIC. A voltage command is sent by APC via the PowerWise Interface (PWI) to the Energy Management Unit (EMU), which adaptively regulates the ASIC supply voltage. Together, these components form a closed loop which automatically optimizes the voltage for the given process and temperature profile. The AVS loop is fast enough to accommodate frequency scaling, which provides even more power savings.



AVS Power Savings

AVS enables 20% to 40% power savings over traditional fixed-voltage scheme across the temperature range and guard bands typical in high performance processors.

Applications

- Network Switches
- Linecards
- Servers