

Panel: Low Power versus High Speed: Can you have both?

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High speed and low power are conflicting requirements in the development of microelectronic systems. Historically, these performance goals have led to separate application paths. On one hand we have high speed, computationally intensive, and easily maintainable systems, expending dozens to thousands of watts of power. On the other hand we have ultra-low power, battery operated, portable or highly isolated (difficult to maintain) systems, operating at power levels where tens of milliwatts matter. These paths represent the two primary dichotomous application areas for high speed, low power VLSI-based systems.

Throughout the late 80's and early 90's, the primary research focus was high speed, processor-oriented systems. Recently, since the early 90's, significant attention has been placed on ultra-low power systems, best identified with portable laptop computers. However, a clear shift has become apparent. High speed and low power have both become of paramount importance. This trend is primarily due to two developing application areas. One area, a continuation of the high speed systems of the late 80's, is extremely high speed, ultra-high density applications, exemplified by 300 plus Mhz. microprocessors with one to two million transistors or more on a single chip. In these systems, the power density of the transistors is of fundamental significance. The second area, an extension of the ultra-low power systems of the early 90's, is battery operated, portable computers which must operate at significantly greater operating speeds than are currently possible while dissipating very little power. Both application areas represent important growth paths within the commercial semiconductor microelectronics sector.

Furthermore, these areas of intense research and development have many features in common, and are expected to coalesce into a unified extremely high speed, ultra-low power semiconductor technology of general utility and applicability.

This panel will explore these issues and discuss how high speed and low power systems can both exist simultaneously. Design techniques and application issues related to this fundamental problem will be presented.