
**VIA Samuel 2**

**Power Measurement Application Note**
**V0.6**

## Background

The VIA Samuel 2 processor is based on a unique internal architecture and is manufactured using an advanced 0.15µ CMOS technology. This architecture and process technology provides a highly compatible, high-performance, low-cost, and low-power solution for the desktop PC, notebook, and Internet Appliance markets.

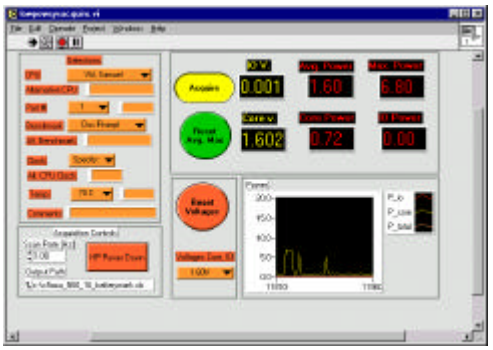
When considered individually, the compatibility, function, performance, cost, and power dissipation of the VIA Samuel 2 processor family are all very competitive. When considered as a whole, the VIA Samuel 2 processor family offers a breakthrough level of *value*.

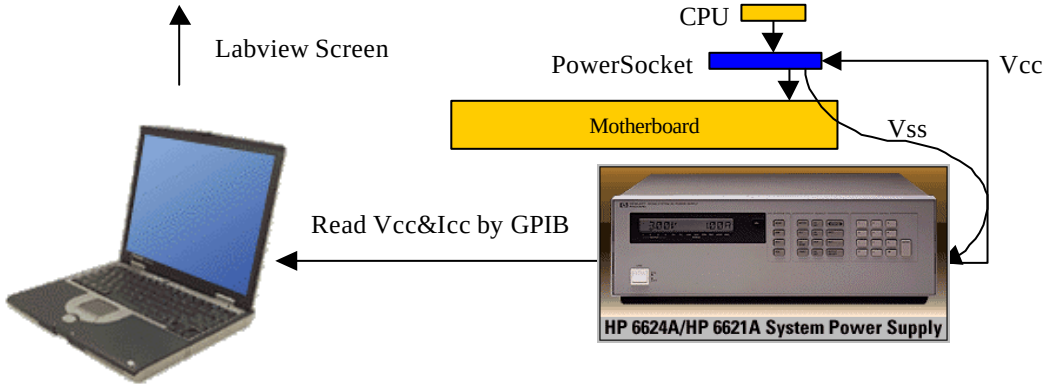
## Introduction

A precise profile of a microprocessor's power consumption is necessary for designing thermal solutions in notebooks, small form factor PCs, and Internet Appliances. Estimating battery life in notebooks also requires understanding of typical power consumption.

## Measurement

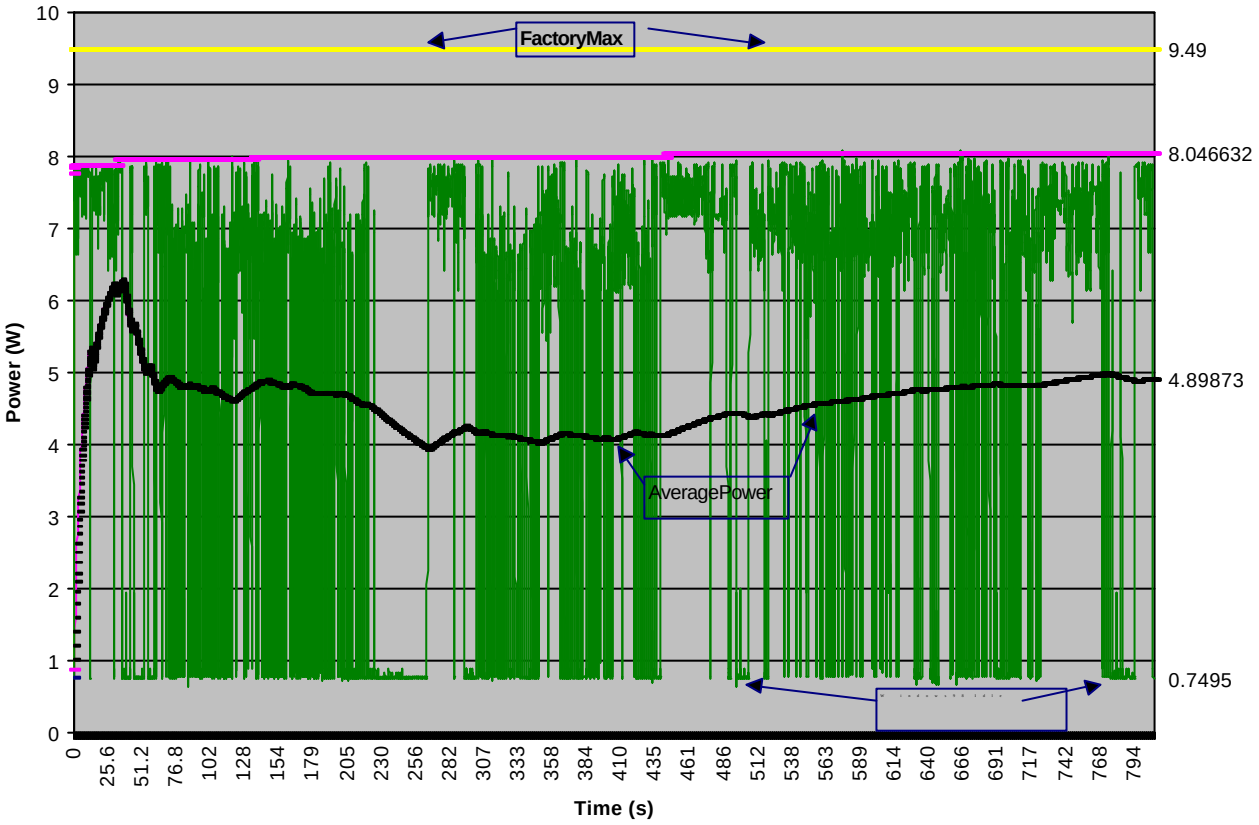
Software application's power usage was measured with the CPU's power plane isolated from the motherboard and supplied from a separate DC power supply. See diagram below.





The DC power supply (not the motherboard) powers the CPU. This allows any motherboard to be tested without modifications. Voltage and power measurements are gathered from the Labview screen and saved to a data file.

The following plot displays the power consumption of the VIA Samuel 2 (700 MHz 1.5V) running WinStone99 from start to finish on Windows 98SE.
The highest wattage value plotted is **FactoryMax**. FactoryMax is highest wattage




possible from the factory when executing the worst case instruction sequence designed to consume the most power. FactoryMax values for each speed grade are listed in Table 1. *Thermal solutions should be designed to FactoryMax.* To assist in thermal monitoring, a synthetic program that consumes the most power (MAXPOW.EXE) is available from a VIA Sales Representative.

**AveragePower** is the average power consumed during WinStone99. Winstone 99 is composed of several popular productivity suites that are typical of normal PC usage. VIA also defines AveragePower as **Typical** power. See Table 1 for specific speed grade values.

Power management features built into Windows 98SE keep the processor in a low power state when idle. This idle state is important to mobile users. The mobile PC's battery life is proportional to the Windows 98SE idle state[1]. This power state is listed under **StopGrant** in Table 1.

[1] This assumes the user does little work with the CPU. Moderate to heavy usage profiles should consider the power consumed while running WinStone 99 to estimate battery life.

The following table outlines the wattage for each CPU speed grade and power state.

**Table 1 VIA Samuel 2 Power Consumption**

| | Typical[2] | Maximum[3] | | Unit |
|---|---|---|---|---|
| Power Management State | | AverageMax[4] | FactoryMax[5] | |
| Normal[1] | | | | |
| 700 MHz | 5.81 | 9.88 | 10.69 | |
| 733 MHz | 6.09 | 10.35 | 11.16 | W |
| 750 MHz | 6.23 | 10.59 | 11.40 | |
| 800 MHz | 6.65 | 11.30 | 12.10 | |
| Stop Grant | | | | |
| 700 MHz | - | 0.99 | 1.21 | |
| 733 MHz | - | 1.04 | 1.26 | W |
| 750 MHz | - | 1.06 | 1.28 | |
| 800 MHz | - | 1.13 | 1.35 | |
| Sleep | | | | |
| 700 MHz | - | 0.98 | 1.21 | |
| 733 MHz | - | 1.02 | 1.25 | W |
| 750 MHz | - | 1.05 | 1.28 | |
| 800 MHz | - | 1.12 | 1.35 | |
| Deep Sleep | | | | |
| 700 MHz | - | 0.46 | 0.63 | |
| 733 MHz | - | 0.46 | 0.69 | W |
| 750 MHz | - | 0.46 | 0.69 | |
| 800 MHz | - | 0.46 | 0.70 | |

Notes

1. The normal power state is the common operating mode of the CPU.
2. Typical power is the average power consumed while running WinStone99 on Win98SE.
3. Maximum power is generated from running the worst case instruction sequence that consumes the most power. Specified at 70C and 1.6V.
4. AverageMax is average value of all parts while running the worst case instruction sequence. Not 100% guaranteed or tested.
5. FactoryMax is the factory limit for power consumption while running the worst case instruction sequence at 70C. Factory will reject parts that exceed these specified values. Thermal solutions should be designed to FactoryMax