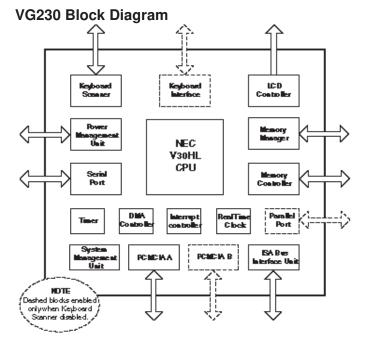## Overview

The Vadem VG230 is a one-chip PC platform which provides OEMs with a highly battery-efficient means to develop cost sensitive, DOS-based, handheld electronic products. The chip contains a processor, all standard XT peripherals, additional high-value peripherals and an ISA bus. Its integrated video architecture shows very fast video performance — up to 9x 386SX systems of the same clock rate. Extensive and proven power management is also standard.

The VG230 contains the 8086-compatible 16 MHz NEC V30HL processor. The chip also embodies a standard XT architecture combined with hardware and software features for rapid design of products with extensive ROM-based software. PCMCIA 2.1 (JEIDA 4.1) PC Card mass storage and miniature peripherals (I/O cards) are supported. The VG230 single-chip PC platform is a single 160-pin CMOS chip handling all PC functions including 16-bit CPU, XT core logic, LCD controller, keyboard scanner and PC Card controller. All that is required for a basic system is the VG230, memory, power supply, display and associated packaging.

VG230 Block Diagram

Key Features

- Single 160-pin chip permits glueless implementation of a fully compatible PC-XT. Local-bus video offers up to 9x the video performance of AT systems.

  Standard-design 16-bit, 16 MHz NEC V30HL processor core integrated on-chip.

  Extensive support for memory-saving "execute-in-place" ROM applications.

  Field-proven, industry standard power management, based on activity monitoring, lengthens battery life.

  Scans up to 101 keys without an external keyboard controller.

  Integrated CGA LCD controller and 640x400 AT&T standard controller. Supports a wide variety of panel resolutions from below CGA to 400-line displays.

  Hardware support for "ink-management" layer for pen-based systems.

  PCMCIA 2.1 (JEIDA 4.1) PC card slot support allowing "hot" insertion/removal (with external buffer).

  Compatible LIM 4.0 hardware superset for RAM, ROM and PC Card memory management.

  Integrated serial port, real-time clock, programmable interrupt controller, DMA controller and internal timer.

  Deactivating keyboard scan enables a second PCMCIA card slot, a bi-directional parallel port and a standard XT keyboard interface.

  Support for DRAM, SRAM, PSRAM and slow refresh memory. Allows up to eight 8-bit RAM banks and up to six 16-bit RAM banks.

  Standard ICE capability simplifies debugging of system designs.

  Offered in a +5V version for maximum performance and a +3V version for maximum battery life.

Functional Description

In addition to the processor, the basic compatibility logic (Timer, Interrupt Controller, and DMA Controller), a Serial Port, a Parallel Port and a Real Time Clock (RTC), the VG230 includes high-value peripherals key to building battery-powered handheld personal electronic products:

- A PC Card Controller handles up to two PCMCIA 2.0 (JEIDA 4.1) card slots. Both I/O and memory cards are supported, as is the memory-saving XIP ("execute-in-place") standard.

The LCD Controller supports all CGA Text and Graphics display modes. With a 400-line display, AT&T 640x400 two-color graphics mode is also supported. For smaller panels, the controller provides hardware support for windowing into the CGA or AT&T frame. Single screen 200-line panels are supported and dual screen 400-line panels are supported. Support is also provided for a separate 200-line ink-plane which is combined via hardware with the main video image. The LCD Controller shares main system memory with the CPU, eliminating dedicated display memory altogether. This local-bus implementation supports direct screen writes up to 9x as fast as a 386SX-based AT of the same clock rate. The LCD Controller may be disabled if an external controller (for example the VG-660 VGA LCD/CRT Controller) is to be used.

An internal Keyboard Scanner may be used or disabled. Enabling this functional block allows direct scanning of an external key matrix up to 101 keys in size. Disabling the Keyboard Scanner activates the Parallel Port, a PC/XT Serial Keyboard Interface, and a second PC Card Slot, reassigning pins to these devices. Support for an external keyboard interrupt source is also provided.

A Power Management Unit (PMU) adapted from the field-proven Vadem VG-647 (Intel™ 82347) power management chip is also included. The PMU significantly lengthens battery life by reducing the CPU clock rate and by cutting power to inactive functional blocks and peripherals. The PMU also monitors battery voltage and produces a maskable interrupt on Low Battery.

The VG230 single-chip PC platform is built around a Single Bus Architecture (pat. pend.) which is ISA compatible. The address and data lines of the Single Bus support 8 bit memory, 16 bit memory and I/O devices, altering signals and timing on the fly as appropriate.

The VG230 single-chip PC platform may be debugged by any standard ICE suitable for the NEC V30HL. A simple interface in the form of a daughterboard connects between the motherboard's VG230 socket and the ICE. The interface brings out the local processor bus to the ICE without affecting the standard VG230 pinout or functionality.

ADDITIONAL INFORMATION
Additional information regarding pinout and pin descriptions, register descriptions, timing characteristics and operating conditions may be obtained from the VG230 data manual.