



MAX77696

PMIC for eReaders with e-ink Displays

Product Brief

Rev A

September 16, 2013

1 General Description

The MAX77696 E-Reader PMIC provides a highly-integrated power management solution. The PMIC features state-of-the-art IC design and packaging to provide significant solution area savings and performance advantages.

The dual-input battery charger includes a power path from the AC adapter/USB input to the system load via a step-down regulator, which is capable of operating as a step-up regulator in the reverse direction for USB OTG and HDMI support, and a separate linear path from an accessory port to the battery to support solar charging and other forms of energy harvesting accessories. The linear accessory path is bidirectional to support powered accessories.

Maxim's Smart Power Selector™ architecture makes the best use of limited adapter power and battery power at all times to supply power to the system. Internal USB charger detection circuitry is compliant with USB BCS 1.2 and integrates charger detection, allowing identification of various resistor-divider networks on D+/D-.

An on-chip fuel gauge employs Maxim's proprietary ModelGauge™ 3.0 algorithm. This fuel gauge utilizes the internal BAT-SYS1 switch as the sense element, eliminating the need for an external current sense resistor.

Four 1.5A and two 800mA step-down regulators switch at 4.0MHz, allowing the use of small magnetic components. The output voltages of all step-down regulators are programmable from 0.6V to 3.3875V in 12.5mV steps. Two of the 1.5A step-down regulators feature dynamic voltage scaling (DVS) logic inputs.

Ten low-dropout (LDO) linear regulators and four load switches supply power to various system blocks. Each LDO and load switch output features an active discharge circuit in shutdown. All LDOs support remote output capacitors, eliminating the requirement for a local bypass capacitor near the PMIC. This helps reduce the total solution size and improves flexibility in PCB routing. All LDOs feature low-noise operation. An LPDDR2 reference buffer sinks and sources up to 1mA to support common memory modules.

A step-up regulator with an integrated high-side current source drives up to eight series LEDs. LED current is programmable in 6.1035μA steps, up to 25mA. The step-up regulator is protected against an open-circuited LED string, while the current source is protected against a short-circuited LED string.

A step-up regulator and an inverting regulator provide power to the source drivers of the E-paper display, while charge pump stages provide power to the gate drivers of the E-paper display. An integrated VCOM buffer amplifier with programmable output voltage and high-impedance shutdown state provides the remaining EPD power circuitry.

An internal 12-bit ADC monitors several internal parameters, in addition to four external inputs.

An integrated On/Off controller, in combination with Maxim's patented flexible power sequencer, provides maximum flexibility in setting default voltages and power-up/-down sequences with minimal intervention from the applications processor.

The MAX77696 PMIC requires only 83 external components and fits in a 314mm² footprint (including external components).

2 Applications

- Wearable Devices
- E-Book Reader

3 Features

- Regulators Operate from 2.6V to 5.5V Supply
- Dual Input Battery Charger
 - 2.1A Switch-mode Charger through USB/AC Adapter Input
 - USB Charger Detection with Automatic Enumeration Capability
 - 500mA Linear Charger through Accessory Input
 - Bidirectional Switchmode Path Supports USB OTG
 - Bidirectional Linear Path Supports Accessories
- Fuel Gauge
 - ModelGauge 3.0 Algorithm
 - No External Current Sense Resistor Required
- Six High-Efficiency Step-Down Regulators
 - Four 1.5A Step-Down Regulators
 - Two 800mA Step-Down Regulators
 - Programmable Output Voltages from 0.6V to 3.3875V in 12.5mV Steps
 - Active Discharge in Shutdown
- Ten Low-Dropout Linear Regulators
 - One 450mA PMOS LDO
 - Four 300mA PMOS LDOs
 - Three 75mA PMOS LDOs
 - Two 150mA NMOS LDOs
 - Active Discharge in Shutdown
- LPDDR2 Reference Buffer with Sink/Source Capability
- Four Load Switches
 - 300mA Output Current Capability
 - Low $R_{DS(on)}$ Switches
 - Active Discharge in Shutdown
- E-Paper Display Power Supplies
 - +/-15V, 150mA VPOS and VNEG Supplies for Source Driver
 - +20V/-22V, 20mA Gate Driver Supplies
 - VCOM Buffer with Programmable Output Voltage
 - High Impedance Shutdown State for VCOM
- 28V White LED Step-Up Converter
 - High-Side Current Source
 - 25mA Maximum LED Current
 - 6.1035 μ A/LSB Resolution
 - Short-Circuit and Open-Circuit Protection
- 12-Bit ADC
 - Four External Inputs
 - Integrated Current Source
- 32kHz Clock Buffer
- Real-Time Clock
- Five Programmable GPIOs
- On/Off Controller
- Flexible Power Sequencer™
- Watchdog Timer
- Reset Generator
- 400kHz I²C-Compatible Serial Interface
- Interrupt Output
- Thermal Shutdown

4 Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX77696AEWI+	-40°C to +85°C	225-Bump WLP 6.4mm x 6.4mm (0.4mm Pitch)

Note: + Denotes a lead (Pb)-free and RoHS Compliant Package

The MAX77696's primary responsibilities are power delivery to the applications processor and E-paper display, USB charger detection and configuration, battery charging and monitoring, timekeeping, and GPIO management. Figure 1 shows a simplified functional block diagram.

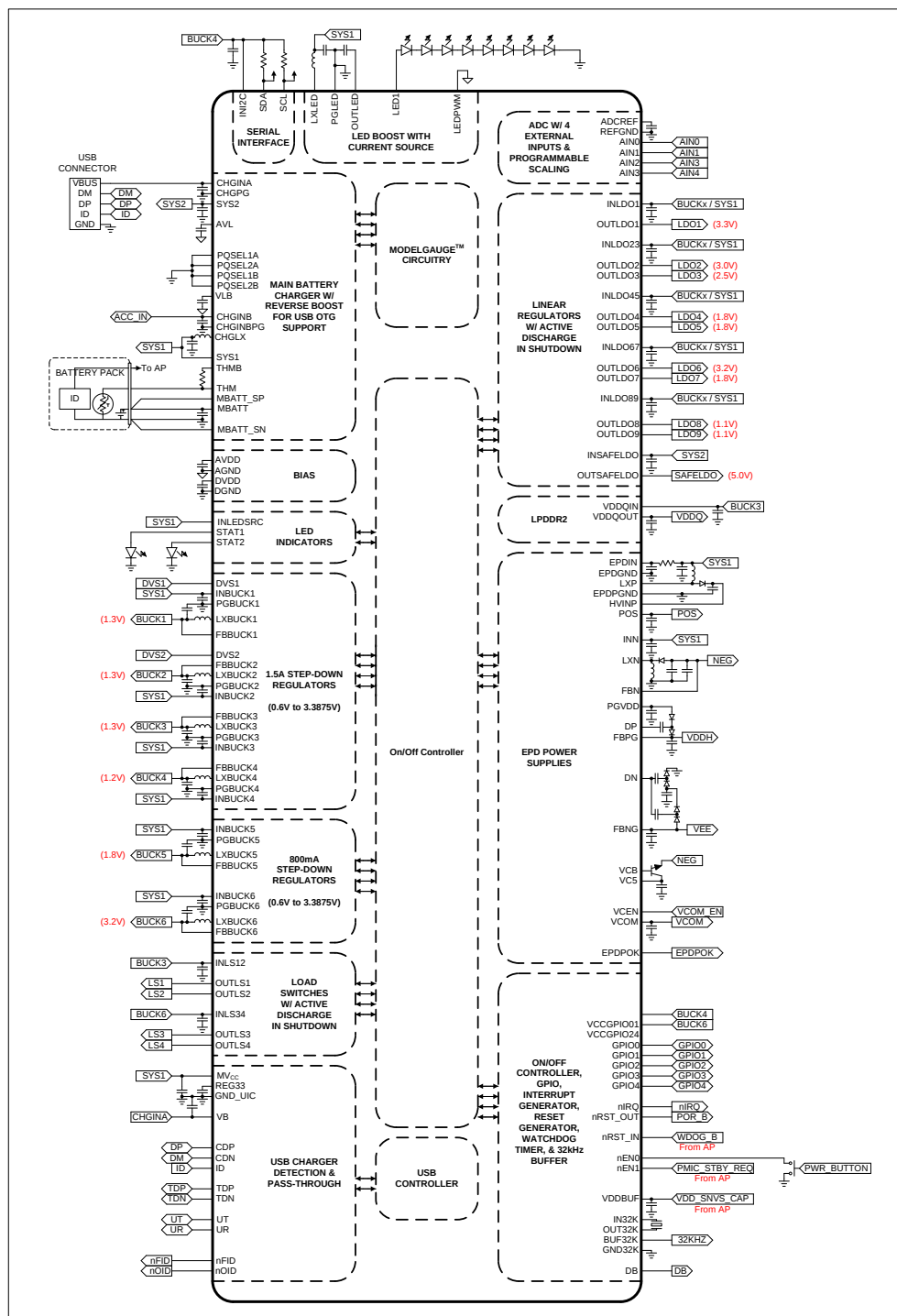


Figure 1. Simplified Block Diagram of MAX77696 PMIC

6 Package Information

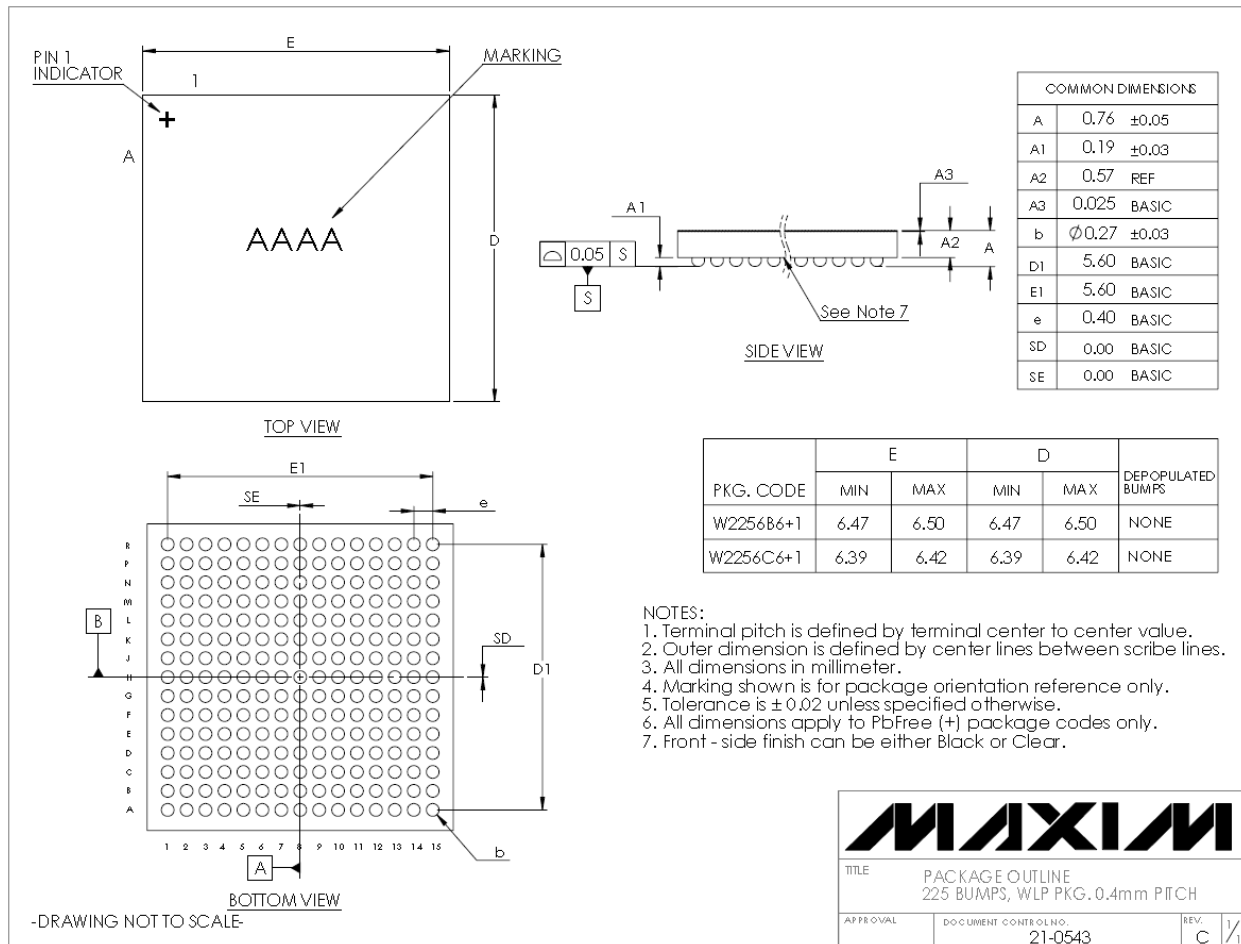


Figure 2 – MAX77696 Package Drawing – Package code is W2256C6+1