XX-XXXX; Rev 0; 7/09

MAXIM

Dual-Output, 3-Phase + 1 Phase Quick-PWM Controller for VR12/IMVP-7

MAX17039

General Description

The MAX17039 is a dual-output, step-down, constant-on-time controller for VR12/IMVP-7 CPU core supplies. The controller consists of two high-current-switching power supplies for the CPU and GPU cores. The CPU regulator (regulator A) is a three-phase constant-on-time architecture. The optional 3rd phase is configured with an external MAX8791 or MAX17491 driver. The second GPU regulator (regulator B) is also a constant-on-time architecture with only single phase.

Both regulators A and B include true differential voltage and current sensing to improve load-line and current-limit accuracy. Switching frequencies are independently programmable, allowing 100kHz to 600kHz per phase operation. Output overvoltage protection (OVP), undervoltage protection (UVP), and thermal protection ensure effective and highly reliable operation. When any of these protection features detect a fault, the controller shuts down both channels.

Regulator A includes transient-phase overlap, which speeds up the response time, reducing the total output capacitance. Regulator A also includes active overshoot suppression to further reduce the required output decoupling capacitance.

Both controllers are fully compliant with Intel's VR12/IMVP-7 serial VID communication and control specifications. CPU and GPU outputs are controlled independently by writing the appropriate data into a function-mapped register file. A slew-rate controller allows controlled transitions between VID codes, controlled soft-start. The SVID interface also allows each regulator to be individually set into a low-power pulse-skipping state. Individual phases can be shut down based on the processors' operating conditions to optimize efficiency. The MAX17039 is available in a lead-free, 56-pin, 7mm x 7mm TQFN package.

Applications

VR12/IMVP-7 CPU Core Power Supplies

Voltage-Positioned Step-Down Converters

Notebooks/Desktops/Servers

Pin Configuration appears at end of data sheet.

Features

- **Supports all Required IMVP-7 Functions**
- **Three-Phase Quick-PWM™ CPU Core (Regulator A)**
  - **Two Internal Drivers and One External Driver**
  - **Active Overshoot Suppression**
  - **Transient-Phase Overlap Mode**
  - **Dynamic Phase Selection**
  - **Phase-Good Fault Detection (Internal)**
- **One-Phase Quick-PWM with Internal Driver (Regulator B)**
- **Intel VR12/IMVP-7-Compliant 25MHz Serial Interface**
- **8-Bit IMVP-7 DAC**
- **±0.4% V_{OUT} Accuracy Over Line, Load, and Temperature**
- **Active Voltage Positioning with Programmable Gain**
- **Accurate Lossless Current Balance**
- **Accurate Droop and Current Limit**
- **Remote Output and Ground Sense**
- **Power-Good Window Comparators (VR__READY)**
- **Output Current Monitors (IMON_)**
- **4.5V to 26V Battery-Input Range**
- **Drives Large Synchronous Rectifier MOSFETs**
- **Programmable 100kHz to 600kHz Switching Frequency**
- **External Thermal-Fault Detection (VR_HOT#) Output**
- **Overvoltage, Undervoltage, and Thermal-Fault Protection**
- **Soft-Start and Soft-Shutdown**
- **Integrated Boost Switches**
- **Low-Profile 56-Lead TQFN Package**

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	FEATURE
MAX17039GTN+	-40°C to +105°C	56 TQFN	3-phase + 1 phase (1 external driver)

+Denotes a lead(Pb)-free/RoHS-compliant package.

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