



# 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), under-voltage 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
- ◆  $\pm 0.4\%$   $V_{OUT}$  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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