Technical Brief

NVIDIA nForce® 790i Ultra SLI®

Extreme DDR3 Performance with SLI-Ready Memory

March 2008 | TB-03896-001_v01

EPP2

Platforms based on the NVIDIA nForce 790i Ultra SLI media and communications processor (MCP) are the first to offer support for Enhanced Performance Profiles 2.0 (EPP 2.0) technology for DDR3 memory.

The successor to DDR2 EPP 1.0 technology, EPP 2.0 technology is designed to leverage the high-speed capabilities of DDR3 technology. With a single click, you can take advantage of a sizeable performance boost without manually hassling with individual settings.

Memory modules equipped with EPP2 technology are easily recognized by the EPP2 or SLI-Ready Memory logo.

How EPP 2.0 Works

The SPD of the DIMM is programmed with additional information that is essential for increasing memory performance. Table 1 depicts the memory mapping of EPP settings within the SPD of DIMMs. What sets EPP 2.0 apart from competing specs is that it contains more tuning settings for DDR3 for stability and performance and has more granular frequency stepping, providing more flexibility.

Motherboards that support EPP 2.0 implement a BIOS that automatically recognizes the presence of EPP 2.0-capable DIMMs and lets you know accordingly. You can enable the technology by simply enabling a single BIOS setting.

When EPP is enabled, the BIOS automatically configures the memory controller with the settings programmed within the EPP 2.0 section of the SPD. This eliminates the need for you to laboriously configure multiple BIOS settings. When EPP 2.0 is enabled the correct settings are automatically applied, ensuring that memory controller is correctly configured.

Table 1 – Enhanced Performance Profiles Setting Mapping

Byte Offset	Bit Field	Description
0	7:6	Profile Size
0	5:3	Profile Format
0	2:0	Profile Purpose
1	7:6	*Reserved*
1	5:0	Voltage Level
2	7:0	Frequency
3	7:6	*Reserved*
3	5:0	Refresh Interval (tREFImax)
4	7:0	CAS Latency (tCLmin)
5	7:0	RAS to CAS Delay (tRCDmin)
6	7:0	Row Precharge Time (tRPmin)
7	7:0	Active to Precharge Time (tRASmin)
8	7:0	Write Recovery Time (tWRmin)
9	7:0	Active to Active/Refresh Time (tRCmin)
10	7:0	Four Activate Window (tFAWmin)
11	7:4	Internal Write to Read Command Delay Time (tWTRmin)
11	3:0	Internal Read to Precharge Command Delay Time (tRTPmin)

EPP 2.0 Benefits

You no longer need to have specific overclocking knowledge to benefit from advanced capabilities of your memory modules.

If you are a PC novice, SLI-Ready memory with EPP 2.0 technology provides:

- A one-click, hassle-free memory performance boost. You can easily take advantage of EPP on the new nForce platform.
- Wide compatibility and the support of system builders and high-performance memory manufacturers.

For the PC enthusiast, SLI-Ready memory with EPP 2.0 technology provides:

- An established baseline that provides overclockers with a higher starting point from which to push memory and processor performance further.
- Exposure of advanced recommended and tested memory settings that are normally not apparent or even understood.

SLI-Ready Memory Ecosystem

SLI-Ready Memory

DDR2 SLI-Ready memory has already been quite successful and has been adopted by PC manufacturers, system builders, enthusiast memory providers, and motherboard manufacturers worldwide. The success of SLI-Ready memory is attributed to its wide adoption, ease of use, stability through certification, and increased performance.

The DDR3 SLI-Ready Memory ecosystem builds on the success of its DDR2 predecessor, offering higher performance compared to DDR2. The speed of the DDR3 memory interface can reach values physically unattainable with DDR2.

DDR3 SLI-Ready Memory Speeds

The nForce 790i SLI platform unleashes the overclocking potential of DDR3 technology, delivering unmatched speeds beyond 2,000 MHz.

However, to reach extreme speeds with rock-solid stability, clever front-to-back engineering design and validation is necessary. The major factors that affect performance are memory controller architecture, board design and layout, DRAM architecture, and cross-platform memory validation.

Memory Controller Architecture

Advanced DDR3 Memory Controller

The NVIDIA nForce 790i Ultra SLI memory controller has been designed from the ground up so you can reach speeds unattainable on any other DDR3 platform.

The memory controller has several performance improving elements including:

1. Advance Path
2. Intelligent data-fetching prediction algorithms
3. Independent arbitration algorithms for improved memory access efficiency.

Advance Path

Advance Path provides the lowest latency data path for memory writes and reads within the nForce 790i Ultra SLI MCP.

The motherboard BIOS implements a dynamic Advance Path deterministic algorithm, which is executed at BIOS initialization on a per-motherboard basis, generating different Advance Path settings for each platform motherboard. You gain additional overclocking headroom as a result.

Intelligent Data-Fetching Algorithms

The nForce 790i Ultra SLI MCP incorporates new intelligent data-fetching prediction algorithms that accelerate data access to and from memory, increasing performance.

This benefit is realized because the prediction algorithms reduce the average latency for CPU accesses.

Independent Arbitration Algorithms

New data-access arbitration algorithms use independent arbiters to perform memory operations. This leads to higher efficiency and increased speeds.

New Motherboard Design

Motherboard design plays a critical role in enabling higher memory speeds and better system stability. When it comes to motherboard design, what matters most are signal integrity, component cooling, and power regulation margin and stability during high power loads.

Signal integrity is affected by board signal routing, signal termination, separation, and the ability to maintain a constant reference power plane. For high-speed design, signal trace lengths must be minimized to reduce latency. Also, proper signal separation eliminates effects like cross talk and simultaneous switching noise. Maintaining a constant reference power plane improves signal quality as well.

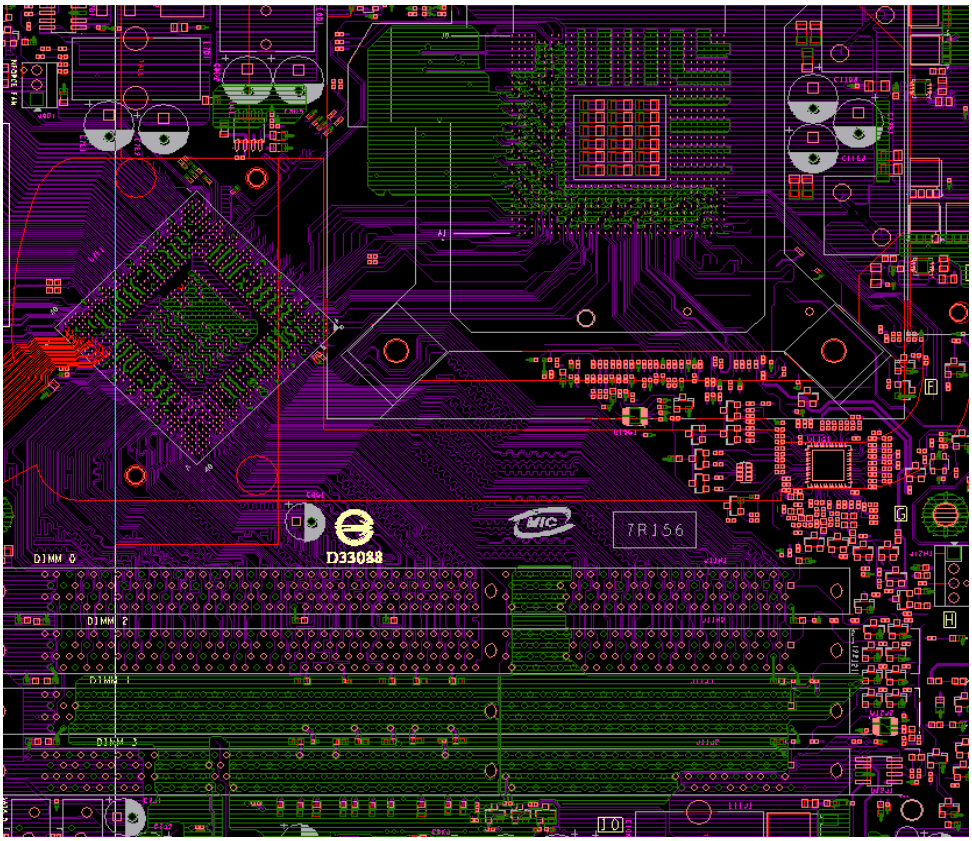

Figure 1 – NVIDIA nForce 790i Ultra SLI Motherboard Layout (DDR3 Memory Interface)

The nForce 790i SLI motherboards are 6-layer boards and their onboard power regulation has been designed to provide more than enough power to overclocked , pushed-to-the-limit systems, while maintaining great regulation efficiency in the process. As such, nForce 790i Ultra SLI motherboards are all designed to provide ample headroom for DDR3 overclocking.

Figure 1 depicts an nForce 790i SLI motherboard DDR3 signal routing.

SLI-Ready Memory Certification Program

Cross-product Compatibility

Cross-product compatibility is critical in any platform ecosystem, but especially for very high-end, overclockable components. As such, NVIDIA emphasizes certification and validation to ensure that you get the best possible experience.

By working directly with DDR3 memory suppliers NVIDIA has cracked the DDR3 speed barrier. Certification ensures that when the SLI-certified memory is paired with an NVIDIA nForce 790i SLI motherboard, you get optimal performance without impacting stability.

If you want to attain the highest speeds, look for the SLI-Ready Memory and EPP2 brands on DDR3 memory.

Benefits of SLI-Ready Memory Ecosystem

There are numerous user benefits to the SLI-Ready memory ecosystem, some of which include:

- Highest memory performance (speeds & latencies) attainable, compared to any competitive DDR3 platform on the market
- Best system stability at rated settings
- Wide industry adoption by top enthusiast-class memory suppliers
- Lowest memory power consumption compared to competitive DDR3 platforms at same frequencies and latencies
- Top-to-bottom enthusiast-class memory support at multiple price points

NVIDIA Corporation | 2701 San Tomas Expressway | Santa Clara, CA 95050 | **www.nvidia.com**