

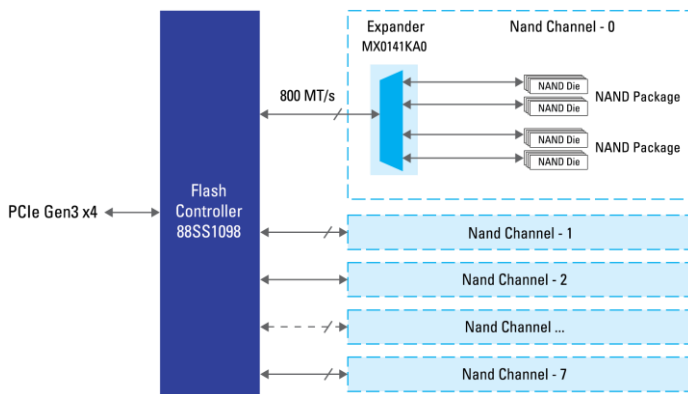
**Description**

**U.2 8TB, PCIe Gen3 x4 Reference Design**

The U.2, 7mm, Marvell® Reference design uses the latest high-performance enterprise SSD controller from Marvell along with the high-performance 1:4 expander/multiplexer from IDT. Together, this combination allows for maximum speeds of up to 800MT/s per channel without compromising capacity.

Each channel supports 512Gb die × 16 for a total of 1TB of flash capacity per channel. Without using the high performance 1:4 expander, the capacitive loading of 16 die would create signal integrity issues and make this level of performance prohibitive.

**Figure 1. Reference Design Block Diagram**



**88SS1098 Controller**

The Marvell 88SS1098 enables high-performance and high-capacity SSDs for use in enterprise and data center environments. Leveraging a quad-core Arm® Cortex®-R5 architecture with support for up to 8GB DRAM, these controllers can enable high-performance SSDs to meet the demands of the most challenging workloads.

For enterprise use cases, the 88SS1098 can also support PCIe Gen3 x4 dual port (active/active) to enable high availability systems. The 88SS1098 leverages the latest Marvell Gen4 NANDEdge™ LDPC engine for extracting the highest performance from MLC and TLC memories while providing the most P/E cycles. The device also supports TCG standards including an AES engine and OTP storage for secure drive configuration.

**Reference Design Features**

**Controller Features**

- Quad Cortex®-R5 CPUs
  - Dynamic Branch Prediction
  - DMA controller
  - PCIe Gen3 x4 (with dual port support)
- DDR Controller
  - Up to 8GB DDR3, DDR4, LPDDR3, LPDDR4 at speeds up to 2400MT/s with ECC support
- Flash Controller
  - 8 Channels at 800MT/s
  - ONFI 2.2/2.3/3.0/4.0, JEDEC mode and Toggle 1.0/2.0

**1:4 High Performance Expander Features**

**Main Features**

- 1:4 high bandwidth 16-bit bus multiplexer
- SSTL18 and SSTL12 signaling
- Supports ONFI 3.0, 4.0, 4.1 and Toggle NAND Flash
- 4.0 × 11 mm FCCSP package with 0.65/0.5mm ball pitch

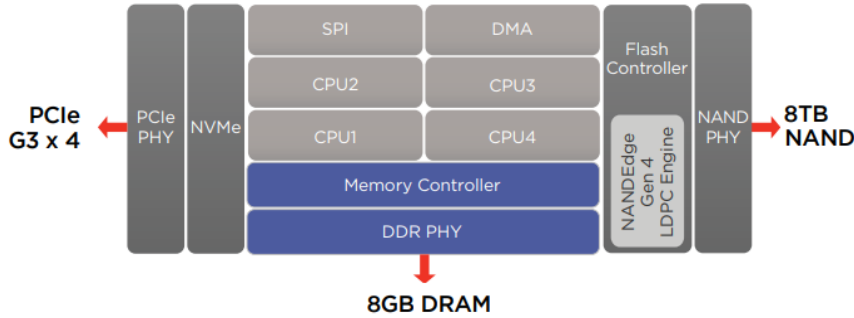
**High-Speed MUX Features**

- Bidirectional passive port switches
- Pull-up/Pull-down/Tristate/bus-hold for deselected ports
- Pin-to-pin output skew < 30ps (within a port)
- Pin-to-pin output skew < 10ps (Differential pairs)
- Propagation delay < 150ps
- Insertion loss < 1dB at 800MHz

**Low Speed MUX/Control Logic Features**

- 4-bit in, 16-bit input/output logic targeted for Chip Enables or port selections
- Multiplexing or decoding
- Unidirectional, active multiplexing
- Multiple function selected via the CFG pins

**Figure 2. 88SS1098 Controller Block Diagram**

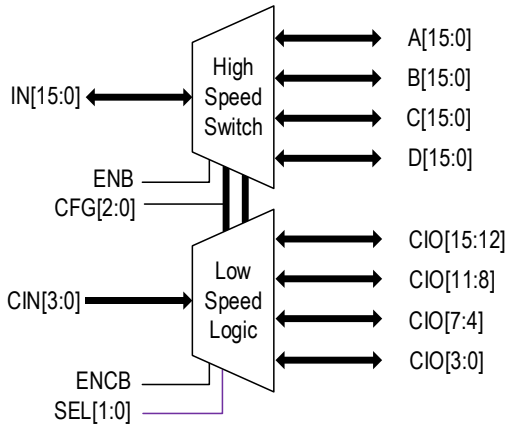


**MX0141KA0 1:4 High Performance Expander**

The 1:4 high-speed MUX is comprised of a high-speed 1:4 multiplexer (mux) path and a low speed multi-function control logic path. The high-speed path consists of four passive switches that connect input port “IN” to four 16-bit output ports A, B, C, and D. The passive switches, which closed selectively, forms a bidirectional multiplexer.

The low-speed path is active multi-function IOs that can be configured in different modes. It can be configured as unidirectional 1:4 mux with 4-bit port width, 4:16 decoder, or 16-bit signals for port selection. The CIO pins can be used to drive Chip Enable pins of the NAND Dies, or be used as a high-speed mux selector.

**Figure 3. MX1014KA0 Block Diagram**



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### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

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