

**Product: PCIe Gen2 ReDriver™ Signal Conditioners**

**Part Numbers: PI2EQX5804, PI2EQX5864**

**Signal Integrity Challenges for Gen2 PCIe Signals**

The 5.0Gbps Gen2 revision of PCIe imposes tight constraints on system and PCB design. When using today's typical PCB rules, a 5.0Gbps signal can be routed just 8 inches before signal degradation becomes a concern (half the distance of 2.5Gbps PCIe Gen-1). To compensate and allow more reasonable trace lengths, lower impedance PCBs and larger signal de-emphasis techniques are suggested. Even when using these techniques, allowable trace runs are very short for many implementations.

To extend the 5.0Gbps differential trace pair greater distances and minimize bit error rate, which will increase system performance and reliability, signal conditioners are used to restore the original signal quality. A signal with higher frequency is affected with more signal attenuation than a signal with lower frequency. The Inter-Symbol-Interference (ISI) caused by both "Dielectric Loss" and "Skin Effect" contributes to Pattern Dependent Jitter (PDJ). A signal conditioner positioned in the data path can adjust signal levels based on equalization and de-emphasis techniques, so that the eye-pattern delivered to the receiver has adequate margins to conform to the PCIe Gen2 standard.

**Pericom Solutions**

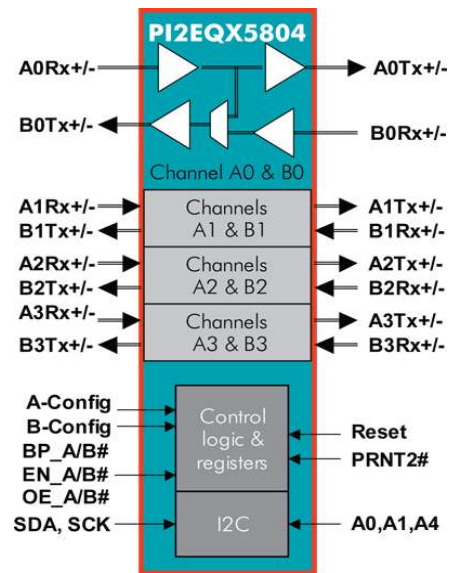
Pericom's many years of experience in supplying signal conditioning products has been applied to the Gen2 performance level. Both equalization and de-emphasis features reverse the "attenuation vs. frequency", thereby compensating for degradation and restoring the signals original source characteristics (signal eye) to the end point receiver. The PI2EQX5804/64 ReDriver products meet the protocol requirements for PCIe Gen2 spec.

**PI2EQX5804**

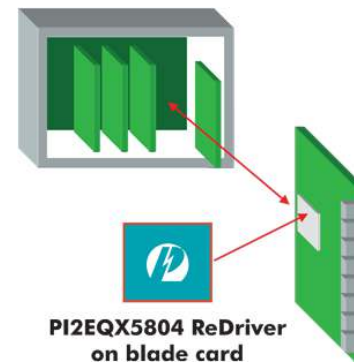
The PI2EQX5804 is a 4-lane (8 differential channels), 5.0Gbps PCIe Gen2 signal conditioner. Designed using Pericom's proprietary high-speed differential signal repeater/equalizer technology, the PI2EQX5804 insures signal integrity over 30 inches of FR4 trace lengths. Combining the programmable equalization techniques at the end of a trace (Rx) to compensate for signal attenuation and the De-emphasis technique to pre-compensate transmission on outputs allows a signal to traverse through a longer medium, beyond the standard PCIe limits. PI2EQX5804 features eight CML-differential inputs and output pairs. This device can Re-Drive four complete PCIe lanes.

**PI2EQX5864**

The PI2EQX5864 is a 4-lane (8 differential channels), 5.0Gbps Gen2 PCIe signal conditioner. This device is a subset of the PI2EQX5804 and features much smaller packaging. The primary functional difference between these two devices is in configuration. Configuration of the PI2EQX5864 can only be made via the I2C interface. Other than pin configuration, the PI2EQX5864 provides the exact same features and functionality of the PI2EQX5804. The PI2EQX5864 is intended as the lowest cost PCIe signal conditioner solution providing 5.0Gbps performance.



**Figure 1: PI2EQX5804 Block Diagram**



**Figure 2: Example of PI2EQX5804 in Blade Server**  
ReDriver on the blades assures signal integrity across the long backplane.

## Key Features & Specifications

- PCIe Gen2 differential signal conditioners
- 5.0Gbps Gen2 PCIe ReDriver
- Programmable receiver equalization
- Programmable transmitter de-emphasis & amplitude
- Pin-strapped or I2C configuration options
- 100-Ohm Differential CML I/O's
- Automatic Receiver Detection and control
- Loop-back and mux/demux modes
- Requires no reference clock
- Low power (100mW per channel)
- Very low-power stand-by mode
- Signal detect & Electrical Idle support per channel
- Vcc Operating Range: 1.2V±0.1V
- Supports 30 inches of FR4 trace
- Packages Offered: Pb-free & Green
- 100-ball LFBGA – 5804
- 56-contact TQFN – 5864

## Application of ReDriver™

Figure 2 shows one example application for PCIeG2 ReDrivers insuring the quality of a signal being passed across the backplane in a rack server. Figure 3 shows the input (left) and output (right) data eye of the PCIe Gen2 ReDriver at 5.0Gbps. A good quality signal output is recovered from a marginal input signal

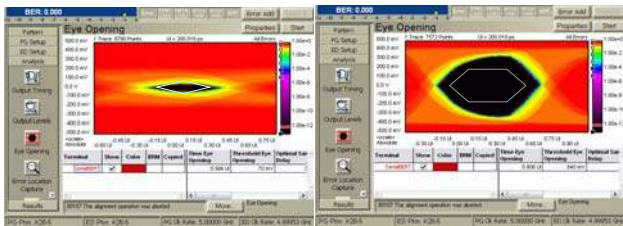


Figure 3: PI2EQX5804 Data Channel

## Applications environment:

- Servers (data and telecom)
- Storage servers
- Test equipment
- Desktop PCs with dual-graphics
- PCIe cables

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