

## GN1406 Quad Multi-rate Repeater / Re-timer

### Features

- LowPower Dissipation
- Multi-rate operation: 2.5Gbps, 3.125Gbps, 5Gbps, or 6.25Gbps
- Supports 1.25Gb/s operation
- High Input Jitter Tolerance
- Retimer resets the jitter budget
- Programmable Input Equalization
- Low latency
- Retimer Bypass Option
- Loss of Lock Indicator
- Loss of Signal Indicator
- Horizontal Phase Adjustment Capability
- Independent Channel Operation
- Individual Channel Power Down
- Selectable Output Level
- Programmable Output De-emphasis
- Individual programmable channels
- I<sup>2</sup>C Control Interface
- Transparent operation for data rate auto negotiation in PCIe® 2.0
- Supports spread spectrum clocking for PCI Express® applications
- Supports Receiver Detect for PCI Express applications
- Supports Electrical Idle preservation for PCI Express applications with ultra-fast Electrical Idle Entry and Exit

**Table A: Ordering Information**

| Part Number | Package    | Case Temperature |
|-------------|------------|------------------|
| GN1406-INE3 | 56-pin QFN | -40°C to +75°C   |

### General Description

The GN1406 is a quad repeater/retimer designed for 2.5Gbps and 5.0Gbps or 3.125Gbps and 6.25Gbps communications. The GN1406 extends the reach and robustness of high-speed serial links by compensating for losses in the transmission medium and resetting the jitter budget.

Each high-speed input interface includes an integrated high input jitter tolerant retimer circuit with adjustable equalization.

The GN1406 high-speed serial output interface features very low jitter and allows for amplitude adjustment through the use of a serial control interface. De-emphasis levels can also be set to compensate for transmission losses.

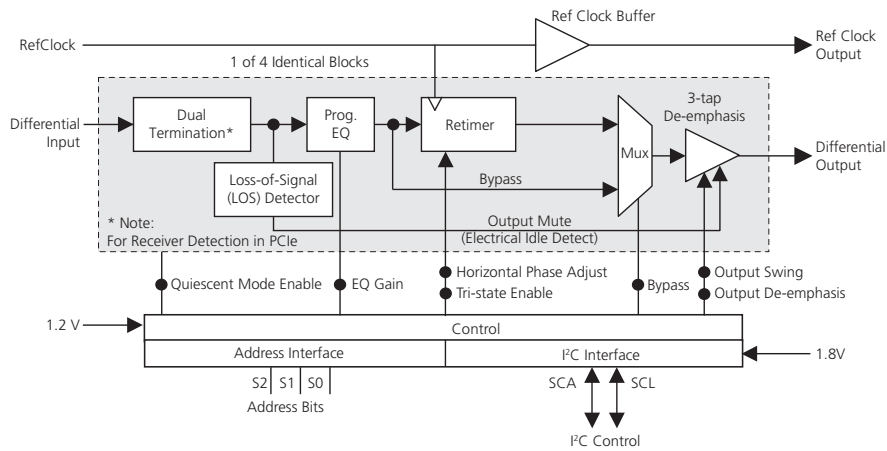
Each channel in the GN1406 can be independently configured or powered down.

### Applications

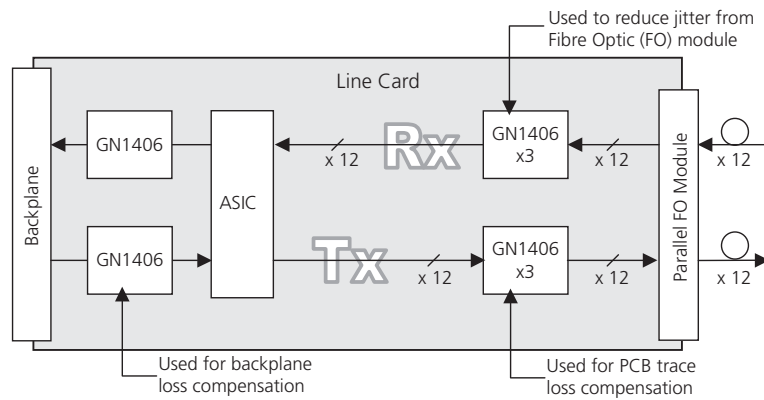
- PCI Express 1.1 and 2.0
- Infiniband SDR/DDR operation
- High-speed serial line card and backplane communications
- Blade servers
- Cable extender
- Parallel optics
- QSFP
- Retimer for SNAP-12, POP-4
- Retimer for CX-4 or LX-4 modules
- Retimer for KX-4 backplane applications

### PCI Express Reference Documents

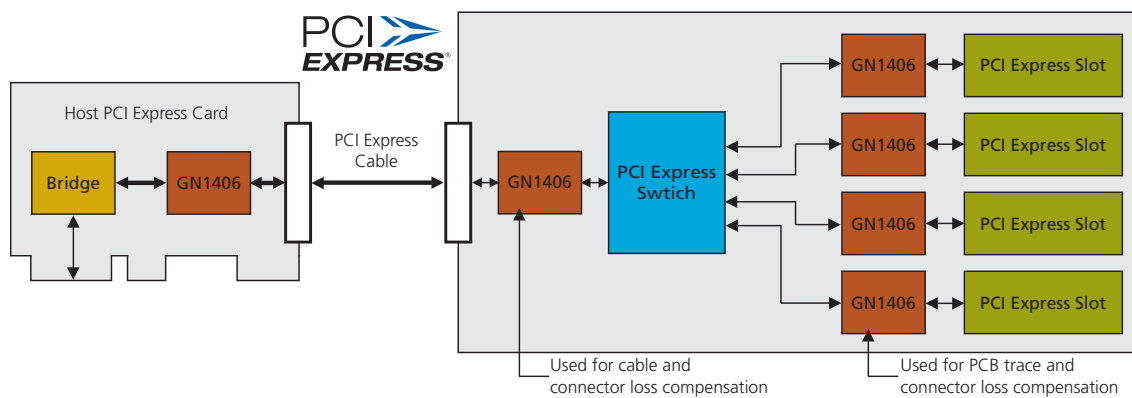
- GN1406 Repeater/Retimer for PCI Express 2.0 (in process)
- PCI Express Base 2.0 Specification
- PCI Express External Cabling 1.0 Specification
- PCI Express CEM (Card Electromechanical) 2.0 Specification



**Figure A: Channel Block Diagram**



**Figure B: Typical Parallel Optics Application**



**Figure C: Typical PCI Express Expansion System Application**

## PCI Express Features

Since the GN1406 is located between the transmitting and receiving devices, it must be completely transparent within the PCI Express Link. The GN1406 equalizer/retimer has specific features to ensure proper operation of the PCIe link. Not all equalizers or repeater/retimers support these features, and therefore, will not work correctly in a PCIe application.

### Electrical Idle Preservation

Electrical idle preservation is a key requirement in the PCI Express protocol, whereby the transmitter differential outputs are held at the same value during power savings and inactive states. The GN1406 quickly detects the electrical idle state on its receive inputs and correctly asserts an idle state on its own output, i.e. holds its differential outputs at the same value. This is done via the Loss-of-Signal (LOS) detector, shown in the [Figure A](#).

### Input Impedance State (Dual Termination)

There are two input impedance states that must be presented to the transmitter under certain conditions.

If the GN1406 is located on the receiver side ([Figure D](#) and [Figure E](#)), high impedance is presented to the transmitter when the receiver is not ready, e.g. when reset is asserted or when it is powered down. By ensuring that the reset signal on the receiver ASIC is the same as on the GN1406, a 100Ω differential impedance is presented to the transmitter. This is the normal operating mode where the receiving device is ready to receive data from the transmitter. If the receiver power supply is powered down, the GN1406 power supply must also be powered down.

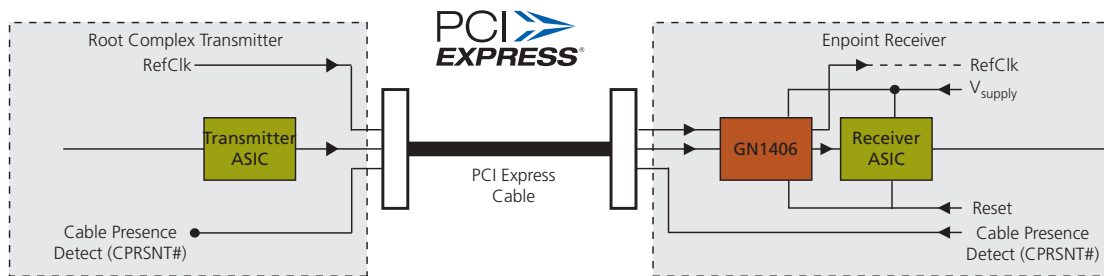


Figure D: GN1406 located on Endpoint receiver of PCI Express Link

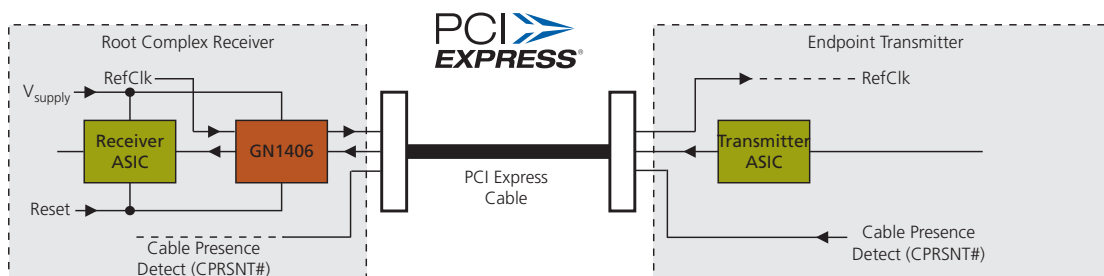
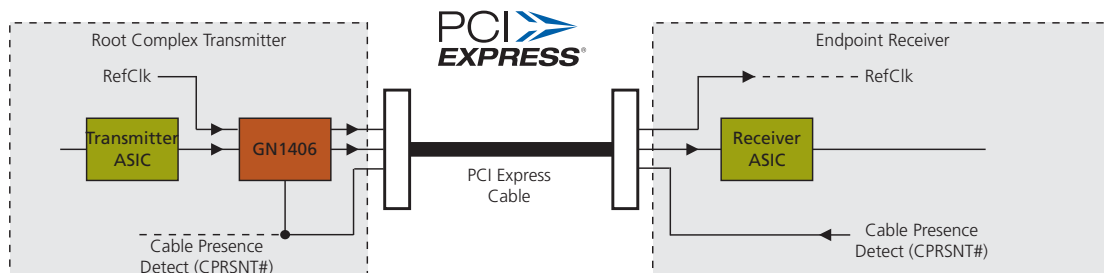


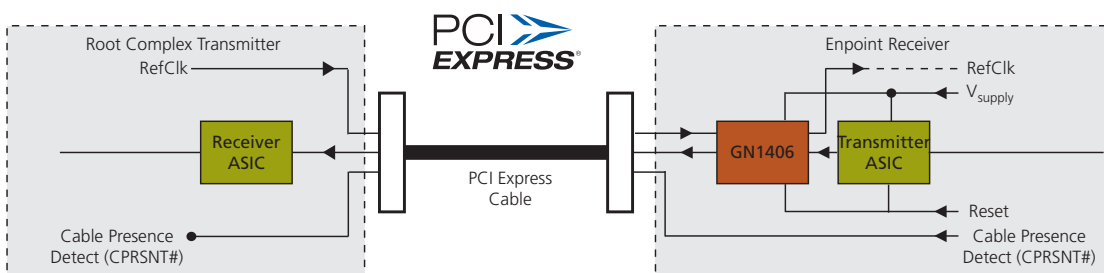
Figure E: GN1406 located on Root Complex receiver of PCI Express Link

If the GN1406 is located on the transmitter side ([Figure F](#) and [Figure G](#)), then the Cable Presence Detect (CPRSNT#) auxiliary signal, as defined in the PCI Express External Cabling 1.0 Specification, is used by the GN1406 to determine if the receiver is ready to receive data. If the CPRSNT# is HIGH (receiver is not ready), then the GN1406 will present a high impedance to the transmitter ASIC. If

CPRSNT# is LOW (receiver is ready), then it will present 100Ω differential impedance to the transmitter.



**Figure F: GN1406 located on Root Complex transmitter of PCI Express Link**

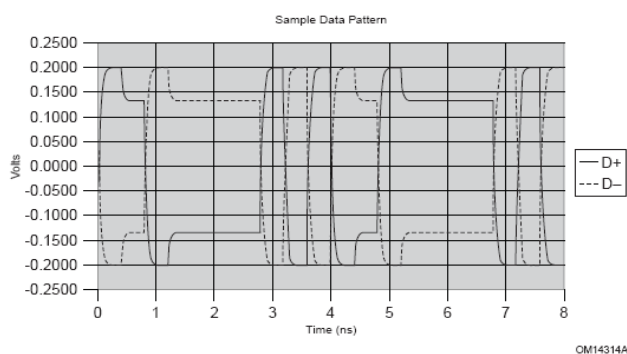


**Figure G: GN1406 located on Endpoint transmitter of PCI Express Link**

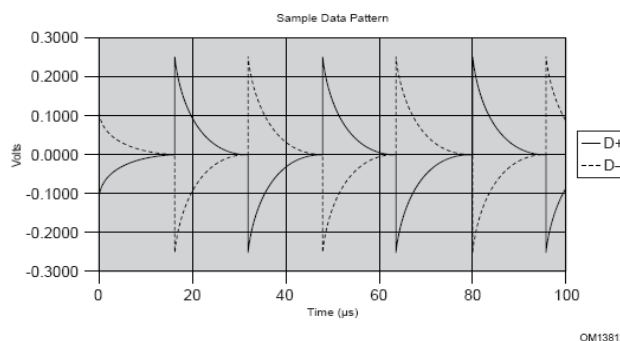
## Beacon Signalling

The PCI Express Base 2.0 Specification shows two examples of beacon signalling.

In retimer and bypass modes, the GN1406 will support the beacon signalling (COM Symbol at full speed), shown in Figure 4-45 of the specification, replicated here as **Figure H**.



**Figure H: Beacon, which includes a 2ns pulse through a 75nF capacitor**



**Figure I: 30kHz beacon signalling through a 75nF capacitor**

In bypass mode only, the GN1406 will support the beacon signalling, shown in Figure 4-44 of the specification, replicated here as **Figure I**.

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## DOCUMENT IDENTIFICATION PRODUCT BRIEF

The product is in a development phase and specifications are subject to change without notice. Gennum reserves the right to remove the product at any time. Listing the product does not constitute an offer for sale.

## CAUTION

ELECTROSTATIC SENSITIVE DEVICES

DO NOT OPEN PACKAGES OR HANDLE EXCEPT AT A  
STATIC-FREE WORKSTATION



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