Optical & IC Products

Featuring High Performance Portfolio

- FiberEdge® TIAs, Laser and Modulator Drivers
- PON-X® TIAs, Laser and Modulator Drivers
- Single-Lane ClearEdge® CDRs
- Dual-Lane ClearEdge CDRs
- Quad-Lane Tri-Edge™ CDRs
- Multi-Lane Signal Conditioners
- ROSAs
- Limiting Amplifiers
- Transceiver ICs
- Optical Reference Design Kits

semtech.com/optical
High-Performance

Optical & Copper IC Products

Semtech designs the industry’s most innovative optical, analog and mixed-signal semiconductor solutions to serve the rising global demand for high-speed data transmission products.

Semtech is an active contributor to networking standards development and has shipped over 2 billion optical ICs. This combination of real-world experience and industry leadership enables us to deliver best-in-class solutions for our customers’ designs.

Semtech offers one of the industry’s most comprehensive portfolios of optical transceiver IC products ranging from 100Mbps to over 100Gbps, supporting key industry standards such as Fibre Channel, InfiniBand®, Ethernet, CPRI, PON, OTN, SONET, and PCI Express®. Semtech is also investing in leading-edge technologies to enable communication systems at 800Gbps and beyond.

For our optical component and module customers, this highly differentiated set of products provides a unique roadmap that improves performance and reliability, while simplifying design, lowering costs and speeding time-to-market.

For systems designers and manufacturers working on the next generation of high-speed networks, Semtech’s multi-lane and multi-rate 10-100Gbps backplane solutions provide cost effective, low power, high performance products to enable next-generation networks.
Semtech Solutions

Enabling High Performance, High-Speed

- Class leading IC solutions for 10G to 800G applications, including SFP28, QSFP28, CFPx, FRx, DRx, SRx, and AOCs
- Full portfolio of integrated solutions for all PON applications and complete reference designs
- Semtech’s ClearEdge® and Tri-Edge™ CDR with low power, reference-free technology
- FiberEdge® Transimpedence Amplifiers (TIAs) that exceed the IEEE Stressed Receiver Sensitivity (SRS) specifications
- FiberEdge Laser Drivers featuring high bandwidth, low noise and THD
- Receive Optical Sub-Assembly (ROSA) based on Semtech’s Rchip technology
- Industry’s first 25G Burst Mode TIA for HS-PON and 25GS-PON OLT applications
- Industry’s first quad CDRs enabling long reach Infiniband® QDR, 40GbE and 100GbE applications
- Full portfolio of integrated solutions to address all SFP+ and XFP modules
- Dual-lane CDRs (Tx/Rx) with integrated DML or EML driver
- Protocol-independent repeaters/redrivers
- Limiting Amplifiers (LA) that provide wideband, low noise post-amplification
- SFP+ reference design kits for optical modules to decrease design time

Building the Future Together

As networking requirements continue to evolve, so will Semtech, by working with customers to provide solutions for tomorrow’s networking challenges. One thing that won’t change, however, is Semtech’s commitment to being a reliable supplier and providing innovative approaches that deliver unrivaled performance for the most sophisticated applications.
Technology Leadership for the Future of Optical Communications

**Technologies**

<table>
<thead>
<tr>
<th>PAM4</th>
<th>Markets</th>
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<tr>
<td>• Chipsets for both 28 and 56Gbaud applications</td>
<td><strong>Data Center</strong></td>
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<tr>
<td>• Industry leading linear performance</td>
<td>• 56 and 28Gbaud PAM4 for SRx modules and AOCs</td>
</tr>
<tr>
<td>• Data center and wireless markets served</td>
<td>• n x 25Gbps NRZ solutions</td>
</tr>
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</table>

**Tri-Edge™ & ClearEdge® CDRs**

<table>
<thead>
<tr>
<th>TRI-EDGE™ &amp; CLEAREDGE® CDRs</th>
<th>Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Market leader in CDRs</td>
<td><strong>5G Wireless</strong></td>
</tr>
<tr>
<td>• Reference-free operation</td>
<td>Market leading 10Gbps, 25Gbps, NRZ, 25Gbps NRZ and 50Gbps PAM4 solutions for SFP28 modules</td>
</tr>
<tr>
<td>• Integrated solutions enable best performance, lowest power and ultra-low latency</td>
<td><strong>PON/FTTH</strong></td>
</tr>
<tr>
<td></td>
<td>• PON-X® portfolio driving the future of PON</td>
</tr>
<tr>
<td></td>
<td>• Industry’s first 25G Burst Mode TIA for HS-PON and 25GS-PON OLT</td>
</tr>
<tr>
<td></td>
<td>• Highly integrated chipset solutions for 10G PON ONU</td>
</tr>
</tbody>
</table>

**TIAs**

Industry leading performance and proven reliability

**Laser Drivers & Limiting Amplifiers**

High performance and discrete integrated solutions for single- and multi-channel applications

**ROSAs**

Best-in-class sensitivity, based on Semtech’s patented Rchip technology

**CopperEdge™**

112G PAM4 Quad Linear Equalizers
PAM4 Connected Data Center

Over the past several years, PAM4 has emerged as the leading technology for implementation of a new generation of data center and wireless optical links.

Standards such as IEEE 802.3bs and 802.3cd provide a common understanding of link requirements enabling interoperability that will drive the PAM4 communications market to scale, thereby reducing costs. Concurrently, applications such as machine learning and 4K video apply continuous pressure on service providers to supply more and more bandwidth. Semtech is uniquely positioned to meet the challenges of this market by providing its customers a wide range of solutions specifically tailored to individual application needs.

Comprised of Semtech’s market-leading, linear, Physical Media Dependent (PMD) FiberEdge® products and advanced physical layer devices, our chipsets for single mode applications set the standard for data center applications. Semtech delivers 100Gbps, single lambda solutions that exceed stringent IEEE, OIF and MSA standards with world class electronics specifically designed and orchestrated for optimal performance.

Leveraging its dominant 25Gbps ClearEdge® CDR and PMD technologies, Semtech’s highly integrated, 56Gbps PAM4 devices provide an optimal mix of low power, high performance and cost effectiveness required to meet the demands of the multi-mode market. Whether utilized in Active Optical Cables (AOCs) or in standard optical transceivers, Semtech’s easy to design in multi-mode PAM4 solutions are the ideal electronics solution for multi-mode optical links.
New Products

GN7060: PON-X® 25G Burst Mode TIA
- Supports 25Gbps/12.5Gbps/10Gbps data rates

GN28L45: PON-X 10G Burst Mode TIA
- Low noise, high sensitivity TIA

GN25L99E: GPON FTTR OLT Combo IC
- Highly integrated solution for Main FTTR Units (MFU)
- 1.25G Burst Mode Rx and 2.5G Tx with proprietary dual loop control

GN2558: Tri-Edge™ PAM4 4x56G CDR + VCSEL Driver
- Lower power consumption, low latency analog CDR and four independent transmit channels
- 200GBASE-SR4 optical transceiver modules
- 200G & 400G QSFP-DD & OSFP Optical transceiver modules

GN1800: Single Channel 56GBd PAM4 Linear TIA
- Supports 56GBd PAM4 operation
- Low IRN—1.9μA typical (30GHz BW)
- High bandwidth: 35GHz typical
- 6.25kΩ differential transimpedance gain
- Overload 2.5mApeak, 2.7mApeak

GN1810: Quad Channel 56GBd PAM4 Linear TIA
- Low power—188mW typical
- Low IRN—1.9μA typical (30GHz BW)
- High bandwidth—35GHz typical
- MGC and AGC Modes with programmable gain/output swing

GN1816: Quad Channel 56GBd PAM4 Linear TIA, 250um pitch
- Low power and IRN
- High bandwidth
- 250um I/O pitch

GN1817: Quad Channel 56GBd PAM4 Linear TIA
- Low power and IRN
- High bandwidth
- Features compensation for extended input inductance, leading to superior overload performance

GN1848: Quad Channel 56GBd PAM4 Linear VCSEL Driver
- Low power and IRN
- High bandwidth
- Superior driver linearity
- Widely programmable VCSEL bias and modulation currents

GN8112: CopperEdge™ 112G PAM4 Quad Linear Equalizers
- Low power consumption
- Operates from a single 3.3V power supply with an integrated POR
- Low latency
- Linear PAM4 programmable equalizer optimized for 56GBaud copper link with up to 15dB equalization
- Enables a transparent ACC solution meeting all IEEE 400GBASE-CR4 Auto-Negotiation and Link Training requirements
- 4x100G or 8x100G Active Copper Cable and 4x100G onboard equalizer
Optical Applications

Semtech offers a comprehensive selection of optical transceiver ICs and components for all 1-10GbE, CPRI, OC-192, and 100G module form factors.
Semtech’s Tri-Edge technology offers the only analog CDR solution for optical modules capable of meeting the low power, low cost requirements needed for data center PAM4 optical interconnects. Tri-Edge also offers significant latency improvements over DSP which are key to HPC and AI data centers demanding the lowest latency. The products are fully compliant to the Open Eye MSA and address a full range of needs for a data center, from 500m to 10km, SR, TOR and Tier 1, in a range of laser and module types.

**Tri-Edge™ CDRs**

**GN2255**
- The GN2255 Tri-Edge CDR is a bi-directional PAM4 CDR with an integrated DML Driver.
- The GN2255 offers an ultra-low power solution in the smallest package size for emerging 5G Advanced wireless front-haul and mid-haul optical transceiver modules.

**GN2256**
- The GN2256 Tri-Edge CDR is a bi-directional PAM4 CDR with an integrated differential EML Driver.
- The GN2256 offers an ultra-low power solution in the smallest package size for emerging 5G Advanced wireless front-haul and mid-haul optical transceiver modules.

**GN2538**
- The GN2538 Tri-Edge CDR is a dual PAM4 CDR re-timer with integrated VCSEL array driver designed for 53.125Gbps signal conditioning within next-gen pluggable optical modules and Active Optical Cables (AOC).
- This PAM4 CDR includes proprietary VCSEL compensation to enable a wide range of VCSEL options with fully adaptive input equalization and fast startup to streamline system bring up.

**GN2539**
- The GN2539 Tri-Edge CDR is a dual PAM4 CDR with an integrated transimpedance amplifier (TIA) array.
- This PAM4 CDR includes configurable output equalization enabling robust electrical interfaces compliant to OIF VSR and IEEE XLAUI specifications.
- The GN2539 linear TIA and CDR provides superior receiver performance with fast adaptation and startup.

**GN2555**
- The Tri-Edge GN2555 CDR is a quad PAM4 CDR with integrated DML laser drivers designed for 53.125Gbps signal conditioning within next generation pluggable optical modules.
- This PAM4 CDR includes proprietary DML laser compensation to enable a wide range of low-cost DML laser options with fully adaptive input equalization and fast startup to streamline system bring up.

**GN2558**
- The GN2558 Tri-Edge CDR is a quad PAM4 CDR re-timer with integrated VCSEL array driver designed for 53.125Gbps signal conditioning within next-gen pluggable optical modules and AOC.
- This PAM4 CDR includes proprietary VCSEL compensation to enable a wide range of VCSEL options with fully adaptive input equalization and fast startup to streamline system bring up.

**GN2559S**
- The Tri-Edge GN2559S CDR is a quad PAM4 CDR with integrated transimpedance amplifiers (TIAs) designed for 53.125Gbps signal conditioning within next generation pluggable single mode and multimode optical modules and active optical cables (AOC).
- When combined with the GN2558/GN2555/GN2556, this Tri-Edge CDR chipset offers low power, low latency analog signal processing solution to meet the needs of artificial intelligence (AI), high-performance computing (HPC) and Cloud data center networks.

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**Watch Now**

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8 Semtech Optical and IC Products ● 2024
ClearEdge® CDRs

Semtech’s multi-lane signal conditioners, based on our reference-free ClearEdge CDR platform with integrated drivers and TIAs, offer the lowest power, smallest footprint solutions for XFP, re-timed SFP+, 25G and 100G modules, in addition to AOCs.

Enabling Next-Generation 100G Markets
Semtech’s 100G ClearEdge CDR portfolio integrates our proven Quad 24G–28G CDRs with VCSEL, DML or EML drivers for transmit with TIAs for receive, targeting both short reach and long reach modules. Our proven integration and the industry’s lowest power and superior performance simplifies 100G designs and lowers cost.

Enabling SFP28 AND 25Gbps AOCs
The GN2147 dual CDR with integrated VCSEL driver and TIA enables high-performance and low cost SFP28 SR modules and AOCs. The single chip design and advanced transmit compensation provides for low cost solutions using a single lens design as well as low bandwidth VCSELs for exceptional BOM savings.

Feature Set for DWDM and Tunable Application
The GN2040 portfolio has a rich feature set to enable optimal performance in DWDM and tunable applications. The features include slice level adjust, programmable peaking on the receive path input and sampling clock phase adjust.

<table>
<thead>
<tr>
<th>ClearEdge CDRs</th>
<th>Part Number</th>
<th>Data Rate (Gbps)</th>
<th>Lanes</th>
<th>Laser Driver</th>
<th>TIA</th>
<th>Slice Level Adjust</th>
<th>Pin Compatibility</th>
<th>Package</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN2017A*</td>
<td>9.95–11.7</td>
<td>2 (1Rx + 1Tx)</td>
<td>VCSEL</td>
<td>–</td>
<td>No</td>
<td>GN2010X</td>
<td>QFN-32</td>
<td>16G FC, 10G FCoE</td>
<td></td>
</tr>
<tr>
<td>GN2040*</td>
<td>9.95–11.3</td>
<td>2 (1Rx + 1Tx)</td>
<td>DML</td>
<td>–</td>
<td>Yes</td>
<td>GN204x</td>
<td>QFN-32</td>
<td>XFP and SFP+, 10GbE, OC-192 and DWDM</td>
<td></td>
</tr>
<tr>
<td>GN2042*</td>
<td>9.95–11.3</td>
<td>2 (1Rx + 1Tx)</td>
<td>DML</td>
<td>–</td>
<td>Yes</td>
<td>GN2044</td>
<td>QFN-32</td>
<td>XFP and SFP+, 10GbE and OC-192 Enables 1W Re-timed SFP+10km</td>
<td></td>
</tr>
<tr>
<td>GN2044*</td>
<td>9.95–11.3</td>
<td>2 (1Rx + 1Tx)</td>
<td>EML</td>
<td>–</td>
<td>Yes</td>
<td>GN1444, GN2042</td>
<td>QFN-32</td>
<td>XFP and SFP+ 10GbE, OC-192 and DWDM Enables 1.5W Re-timed SFP+ 40/80km</td>
<td></td>
</tr>
<tr>
<td>GN2044S*</td>
<td>9.95–11.3</td>
<td>2 (1Rx + 1Tx)</td>
<td>EML</td>
<td>–</td>
<td>Yes</td>
<td>GN1444S</td>
<td>QFN-32</td>
<td>Tunable SFP+, OC-192 and DWDM Enables 1.5W Re-timed TSFP+</td>
<td></td>
</tr>
<tr>
<td>GN2045/55C*</td>
<td>24–28</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>FC-CSP</td>
<td>100Gbps Ethernet, Infinband EDR</td>
<td></td>
</tr>
<tr>
<td>GN21095*</td>
<td>24–28</td>
<td>4</td>
<td>DML</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>WL-CSP</td>
<td>100Gbps Ethernet, PAM4, CWDM4, LR4</td>
<td></td>
</tr>
<tr>
<td>GN21096ST*</td>
<td>24–28</td>
<td>4</td>
<td>EML</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>BGA</td>
<td>100Gbps Ethernet/OTN, Infinband EDR</td>
<td></td>
</tr>
<tr>
<td>GN21098*</td>
<td>24–28</td>
<td>4</td>
<td>VCSEL</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>Die</td>
<td>100Gbps Ethernet SR4</td>
<td></td>
</tr>
<tr>
<td>GN21095/105*</td>
<td>24–28</td>
<td>4</td>
<td>–</td>
<td>Yes</td>
<td>Yes</td>
<td>GN2109S</td>
<td>Die</td>
<td>100Gbps Ethernet/OTN PSM4, CWDM4, CLR4</td>
<td></td>
</tr>
<tr>
<td>GN2115*</td>
<td>24–28.1</td>
<td>2 (Rx + Tx)</td>
<td>EML/MZM</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>–</td>
<td>Fixed DWDM and Tunable DWDM up to 40km</td>
<td></td>
</tr>
<tr>
<td>GN2127*</td>
<td>24–28.1</td>
<td>2 (Rx + Tx)</td>
<td>VCSEL</td>
<td>Yes</td>
<td>–</td>
<td>–</td>
<td>Die</td>
<td>25Gbps AOC</td>
<td></td>
</tr>
<tr>
<td>GN2148*</td>
<td>24–28.1</td>
<td>1</td>
<td>VCSEL</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Die</td>
<td>SFP28 SR</td>
<td></td>
</tr>
<tr>
<td>GN2159*</td>
<td>24–28.1</td>
<td>1</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>–</td>
<td>Die</td>
<td>SFP28 SR</td>
<td></td>
</tr>
<tr>
<td>GN2152/28*</td>
<td>24–28.1</td>
<td>2 (Rx + Tx)</td>
<td>DML</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>–</td>
<td>SFP28 LR, BiDi, CWDM</td>
<td></td>
</tr>
<tr>
<td>GN2154*</td>
<td>24–28.1</td>
<td>2 (Rx + Tx)</td>
<td>SE-EML</td>
<td>Yes</td>
<td>–</td>
<td>–</td>
<td>SFP28 DWDM and LAN–WDM up to 80km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Please contact your sales representative for more details.
Transceiver ICs (LD & LA)

High performance laser drivers and limiting amplifiers for optical communications.

**GN25L99E**
1.25Gbps burst mode limiting post amplifier and 2.5Gbps laser driver for cost critical G Pon FTTR (Fiber-To-The-Room) main unit applications. GN25L99E features automatic ER and APC control.

**GN1196/GN1158**
Semtech’s latest, lowest power transceiver IC for SFP+ LR/SR applications with integrated APC and advanced eye-shaping features.

**GN28L97B**
An integrated 2.5G burst mode laser driver and 10G limiting post amplifier targeting low cost BoB XGPON ONU applications.

**GN28L98**
Integrates a 10G burst mode laser driver with dual loop ER control and advanced eye-shaping with a 10G limiting post amplifier. GN28L98 targets low cost BoB XGSPON ONU applications.

**GN7153B**
An integrated 10G EML laser driver and dual rate 10G/2.5G burst mode limiting amplifier with built-in AC-coupling discharge circuit.

**GN1444/445**
Highly integrated, low power, small footprint transceivers that are ideal for SFP+ ER optical modules.

**GN7154**
An integrated 10G EML driver and dual rate 10G/1G burst mode limiting amplifier for 10GEPON OLT applications.

**GN7155B**
An integrated 10G EML laser driver and 2.5G burst mode limiting amplifier for XGPON OLT applications.

<table>
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<th>Transceiver IC (LD and LA)</th>
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<td>GN1157</td>
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<tr>
<td>GN1157B*</td>
</tr>
<tr>
<td>GN1158</td>
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<tr>
<td>GN1159*</td>
</tr>
<tr>
<td>GN1196*</td>
</tr>
<tr>
<td>GN25L95C</td>
</tr>
<tr>
<td>GN25L95(D)</td>
</tr>
<tr>
<td>GN25L96</td>
</tr>
<tr>
<td>GN25L98</td>
</tr>
<tr>
<td>GN25L99E</td>
</tr>
<tr>
<td>GN28L95</td>
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<tr>
<td>GN28L96</td>
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<tr>
<td>GN28L97B</td>
</tr>
<tr>
<td>GN28L98</td>
</tr>
<tr>
<td>GN7153B</td>
</tr>
<tr>
<td>GN7154</td>
</tr>
<tr>
<td>GN7155B</td>
</tr>
</tbody>
</table>
TIAs

Wideband, low noise transimpedance amplifiers (TIAs) for optical communication applications

Semtech offers a portfolio of fully integrated BiCMOS and pure CMOS transimpedance amplifiers providing wideband, low noise pre-amplification of a current signal from a PIN photodiode or APD.

Semtech’s TIAs offer best-in-class performance in limiting, linear or automatic gain control versions for use in high performance optical receivers operating from 155Mbps to 100Gbps.

Features

• Wideband, low noise
• Limiting, linear and AGC versions
• Fully integrated on-chip de-coupling for low cost and best performance

Applications

• ITU/IEEE-based transmission systems
• 10G and 100G Ethernet
• SONET/SDH based transmission systems, test equipment and optical modules from OC-3 to OC-192
• 8G and 16G Fibre Channel
• Serial data systems up to 28Gbps
• PON/FTTH systems – EPON, GPON, 10GEPON, XG Pon, XGSPON, HS-PON and 25GS-PON
• 6G and 1–12G CPRI modules for wireless front haul
• 100Gbps client side modules

GN1081, GN1084, GN1085, GN1088
1 x 28Gbps and 4 x 28Gbps limiting TIA optimized for 100GBASE-LR4 applications

GN1700
1x 25GBd PAM4 linear TIA

GN1089, GN1810, GN1812
1 x 56Gbd and 4 x 56Gbd PAM4 linear TIAs, 750um pitch

GN1814
4 x 56Gbd PAM4 linear TIA, 500um pitch

GN1816
4 x 56Gbd PAM4 linear TIA, 250um pitch

GN1817
4 x 56Gbd PAM4 linear TIA, 750um pitch with compensation for extended input inductance

GN7060
25Gbps limiting TIA designed for HS-PON and 25GS-PON OLT applications

GN7055, GN7056, GN28L45
Limiting TIA designed specifically for XGSPON and 10G EPON OLT applications

GN7069
10Gbps limiting TIA designed for APD applications such as 5GHz Wi-Fi immune 10G PON ONUs

GN1090
Quad VCSEL driver for parallel and multi-channel datacom and telecom modules with low power consumption, 210mW typical for 4 channels. Can be used together with GN1090 quad TIA.

GN28L54A
10Gbps limiting TIA designed for APD applications such as 10G PON ONUs

GN28L55A
Industrial lowest sensitivity and power 10Gbps CMOS TIA for telecom and data center
## TIAs

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Overview</th>
<th>Data Rate (Gbps)</th>
<th>Gain (kΩ)</th>
<th>BW (GHz)</th>
<th>Supply (V)</th>
<th>Noise</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN28L54A</td>
<td>10G Limiting</td>
<td>10.3</td>
<td>7</td>
<td>6</td>
<td>3.3</td>
<td>*</td>
<td>-</td>
</tr>
<tr>
<td>GN28L45</td>
<td>Multi-rate Burst Mode TIA</td>
<td>12.44/2.5</td>
<td>3.6/4.6/11.5</td>
<td>8.7/2.2/1.14</td>
<td>3.3</td>
<td>*</td>
<td>-</td>
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<tr>
<td>GN7060</td>
<td>25G PON Burst Mode TIA</td>
<td>to 25</td>
<td>8</td>
<td>6/7.8</td>
<td>3.3</td>
<td>*</td>
<td>-</td>
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<tr>
<td>GN1068</td>
<td>14G Limiting</td>
<td>to 14.3</td>
<td>6.75</td>
<td>12</td>
<td>3.3</td>
<td>1.2μA</td>
<td>CPRI, 10GBase-SR/LR/ER and 16G FC</td>
</tr>
<tr>
<td>GN1069</td>
<td>12.5G Limiting</td>
<td>to 12.5</td>
<td>9</td>
<td>11.5</td>
<td>3.3</td>
<td>0.86μA</td>
<td>-</td>
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<tr>
<td>GN1088*</td>
<td>2BG Limiting</td>
<td>25-28</td>
<td>6</td>
<td>23</td>
<td>3.3</td>
<td>1.25μA</td>
<td>25Gbps and 100Gbps Ethernet/OTN, Infiniband EDR</td>
</tr>
<tr>
<td>GN1088*</td>
<td>Quad 2BG Limiting</td>
<td>28</td>
<td>5</td>
<td>23</td>
<td>3.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GN1090</td>
<td>Quad 10G Limiting</td>
<td>to 14.3</td>
<td>*</td>
<td>*</td>
<td>3.3</td>
<td>0.9μA</td>
<td>40Gbps Ethernet, Infiniband, QSFP+</td>
</tr>
<tr>
<td>GN25L53</td>
<td>3.1Gbps AGC TIA</td>
<td>3.1</td>
<td>5.5</td>
<td>1.9</td>
<td>3.3</td>
<td>335nA</td>
<td>CPRI, GPON, OC-48 (APD)</td>
</tr>
<tr>
<td>GN7055</td>
<td>Multi-rate PON Burst Mode TIA</td>
<td>10.3/2.5/1.25</td>
<td>3.6/4.6/11.5</td>
<td>8.7/2.2/1.14</td>
<td>3.3</td>
<td>*</td>
<td>10G XGS-PON/10G EPON/2.5G XG-PON/1.25 EPON</td>
</tr>
<tr>
<td>GN7069</td>
<td>10G Limiting</td>
<td>to 11.3</td>
<td>8</td>
<td>10</td>
<td>3.3</td>
<td>0.9μA</td>
<td>APD ROSAs for 10G PON ONU</td>
</tr>
<tr>
<td>GN7053*</td>
<td>1G GPON Burst Mode Limiting</td>
<td>1.25</td>
<td>1.25</td>
<td>1.5</td>
<td>3.3</td>
<td>*</td>
<td>1G GPON OLT</td>
</tr>
<tr>
<td>GN7058R</td>
<td>Multi-rate PON Burst Mode TIA</td>
<td>10.3/1.25</td>
<td>3.5/12.2</td>
<td>8.9/1.7</td>
<td>3.3v</td>
<td>*</td>
<td>10GbE EPON OLT</td>
</tr>
<tr>
<td>NT20R67</td>
<td>155Mbps AGC TIA</td>
<td>0.155</td>
<td>63</td>
<td>0.165</td>
<td>3.3/5.0</td>
<td>11nA</td>
<td>OC-3, Fast Ethernet</td>
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<tr>
<td>NT20067</td>
<td>155Mbps AGC TIA</td>
<td>0.155</td>
<td>23</td>
<td>0.165</td>
<td>3.3/5.0</td>
<td>11nA</td>
<td>OC-3, Fast Ethernet</td>
</tr>
<tr>
<td>NT24L50</td>
<td>1.25Gbps AGC TIA</td>
<td>1.25</td>
<td>25</td>
<td>0.75</td>
<td>3.3</td>
<td>92nA</td>
<td>GbE, EPON</td>
</tr>
<tr>
<td>NT24L55</td>
<td>1.25Gbps High Sensitivity AGC TIA</td>
<td>1.25</td>
<td>46</td>
<td>0.75</td>
<td>3.3</td>
<td>74nA</td>
<td>EPON</td>
</tr>
<tr>
<td>NT25L51</td>
<td>2.5Gbps AGC TIA</td>
<td>2.5</td>
<td>8</td>
<td>1.7</td>
<td>3.3</td>
<td>230nA</td>
<td>OC-48, GPON (APD)</td>
</tr>
<tr>
<td>GN1089</td>
<td>Single Channel PAM4 Linear</td>
<td>100</td>
<td>5</td>
<td>34</td>
<td>3.3</td>
<td>2.4μA</td>
<td>56Gbd Ethernet PAM4 modules (100GBase and 400GBase)</td>
</tr>
<tr>
<td>GN1800</td>
<td>Single PAM4 Linear</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>56Gbd Ethernet PAM4 modules (100GBase)</td>
</tr>
<tr>
<td>GN1700</td>
<td>Single PAM4 Linear</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>25Gbd Wireless PAM4 modules</td>
</tr>
<tr>
<td>GN1810</td>
<td>Quad PAM4 Linear</td>
<td>100</td>
<td>5</td>
<td>34</td>
<td>3.3</td>
<td>2.4μA</td>
<td>56Gbd Ethernet PAM4 modules (400GBase)</td>
</tr>
<tr>
<td>GN1812</td>
<td>Quad PAM4 Linear</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>56Gbd Ethernet PAM4 modules (400GBase)</td>
</tr>
<tr>
<td>GN1814</td>
<td>Quad PAM4 Linear, 500μm pitch</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>56Gbd Ethernet PAM4 modules (400GBase, 2X400GBase and 800GBase)</td>
</tr>
<tr>
<td>GN1817</td>
<td>Quad PAM4 Linear</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>56Gbd Ethernet PAM4 modules (400GBase)</td>
</tr>
<tr>
<td>GN1816</td>
<td>Quad PAM4 Linear, 500μm pitch</td>
<td>100</td>
<td>5.5</td>
<td>35</td>
<td>3.3</td>
<td>1.9μA</td>
<td>56Gbd Ethernet PAM4 modules (400GBase, 2X400GBase and 800GBase)</td>
</tr>
</tbody>
</table>

* Please contact your sales representative for more details.
Laser Drivers & Limiting Amplifiers

High performance laser drivers and limiting amplifiers for optical communications.

**Applications**
- 100Gbps Ethernet
- 6Gbps and 10Gbps CPRI Modules for Wireless Front Haul
- 40G QSFP+ Modules
- 8G Fibre Channel
- 9.95Gbps OC-192 and 10.70Gbps OC-192 with FEC

**Limiting Amplifiers**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Overview</th>
<th>Data Rate (Gbps)</th>
<th>Gain (dB)</th>
<th>BW</th>
<th>Supply (V)</th>
<th>Noise Figure (uV)</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT24L73</td>
<td>1.25Gbps CMOS limiting amplifier with CML data outputs and signal status in an MSOP package</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>NT20045</td>
<td>200Mbps Limiting Amp</td>
<td>0.2</td>
<td>60</td>
<td>0.125</td>
<td>3.3/5.0</td>
<td>80</td>
<td>OC-3, Fast Ethernet</td>
</tr>
<tr>
<td>NT24L73</td>
<td>1.25Gbps Limiting Amp</td>
<td>1.25</td>
<td>46</td>
<td>0.93B</td>
<td>3.3</td>
<td>300</td>
<td>OC-3, OC-12, GbE</td>
</tr>
</tbody>
</table>

**Laser Drivers**

**GN1185**
High-performance quad 25–28Gbps DML driver for active TOSAs targeting 100G applications

**NT20042**
Low cost 3.3V/5.0V 300Mbps LED driver for SONET/SDH, ESCON and Fast Ethernet applications over optical fiber

**GN1848**
Quad channel 56GBd PAM4 linear VCSEL driver with low power, low IRN, high bandwidth and superior driver linearity. Can be used together with GN1816 quad TIA.

**GN1190**
Quad VCSEL driver for parallel and multi-channel datacom and telecom modules with low power consumption, 210mW typical for 4 channels. Can be used together with GN1090 quad TIA.

**GN7151**
GN7151 is a 10G EML driver integrating ClearEdge® reference free CDR to deliver best-in class eye quality and enabling lower power modules for 10G PON OLT applications

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* Please contact your sales representative for more details.
ROSAs

Best-in-class receive optical sub-assemblies (ROSAs) based on patented Rchip technology

Features

• Best-in-class stressed receiver sensitivity
• High gain to ensure exceptional crosstalk performance within the module
• Patented Rchip technology to ensure maximum module manufacturing yield
• Super high gain delivers most integrated, lowest power SFP+ solution

Applications

• 10GBASE-LR
• 10GBASE-ER
• 10GBASE-LRM
• OC-192 SR-1
• OC-192 IR-2
• 10G EPON
• Low OSNR DWDM
• 8GFC and 10GFC
• 25G Ethernet
• 28GBd and 56GBd PAM4

<table>
<thead>
<tr>
<th>ROAs and Super High Gain ROSAs</th>
<th>Part Number</th>
<th>Overview</th>
<th>Data Rate (Gbps)</th>
<th>Gain (kΩ)</th>
<th>Supply</th>
<th>RSSI</th>
<th>Unstressed Sensitivity</th>
<th>Comments</th>
<th>ODL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GN3257</strong></td>
<td>PIN with AGC</td>
<td>to 11.3</td>
<td>B.5</td>
<td>+3.3V ±10%</td>
<td>Yes</td>
<td>-13dBm</td>
<td>–</td>
<td>-27dB</td>
<td></td>
</tr>
<tr>
<td><strong>GN3357</strong></td>
<td>High Gain APD with AGC</td>
<td>to 11.3</td>
<td>B.5</td>
<td>+3.3V ±10%</td>
<td>VAPD</td>
<td>-27dBm</td>
<td>–</td>
<td>-27dB</td>
<td></td>
</tr>
<tr>
<td><strong>GN3358</strong></td>
<td>High Gain APD Rchip</td>
<td>to 11.3</td>
<td>13</td>
<td>+3.3V ±10%</td>
<td>VAPD</td>
<td>-27dBm</td>
<td>Ideal for non-retimed SFP+</td>
<td>-27dB</td>
<td></td>
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<tr>
<td><strong>GN3270</strong></td>
<td>25G Limiting PIN ROSA</td>
<td>2B</td>
<td>6</td>
<td>+3.3V ±10%</td>
<td>Yes</td>
<td>-14dBm</td>
<td>SFP28 LR applications</td>
<td>-27dB</td>
<td></td>
</tr>
<tr>
<td><strong>GN3289</strong></td>
<td>56GBd Linear AGC ROSA</td>
<td>to 100</td>
<td>5</td>
<td>+3.3V ±10%</td>
<td>Yes</td>
<td>-7.7dBm</td>
<td>100Gbps Ethernet operation using PAM4 modulation</td>
<td>OMA</td>
<td>-27dB</td>
</tr>
<tr>
<td><strong>GN3361</strong></td>
<td>High Gain APD with AGC</td>
<td>to 11.3</td>
<td>B.5</td>
<td>+3.3V ±10%</td>
<td>VAPD</td>
<td>-26.5dBm</td>
<td>–</td>
<td>-27dB</td>
<td></td>
</tr>
<tr>
<td><strong>GN3362</strong></td>
<td>Limiting APD ROSA</td>
<td>to 11.3</td>
<td>8</td>
<td>+3.3V ±10%</td>
<td>VAPD</td>
<td>-27.5dBm</td>
<td>–</td>
<td>-27dB</td>
<td></td>
</tr>
</tbody>
</table>

* Please contact your sales representative for more details.
Backplane & Linecard Signal Conditioners

Semtech’s multi-channel signal conditioners enhance the reach and robustness of high-speed serial links by compensating for transmission losses and resetting crosstalk and jitter budgets.

High Level of Integration and Small Footprint
Semtech’s backplane and linecard signal conditioners are ideal for small form factor modules or dense backplane/linecard applications.

Full Portfolio
Semtech products offer solutions for Ethernet, Infiniband, Fibre Channel, and PCI Express. Solutions are available with and without CDR functionality.

Drive Long Backplanes or Cables
A combination of Equalizer, DFE and ClearEdge® CDR technology allows for an optimal solution to drive long, dense backplanes or cables at high speeds.

Low Power
Semtech’s ClearEdge CDR products require the lowest power in the industry, a key factor as densities increase.

Reset the Jitter and Crosstalk Budgets
Using CDRs resets jitter budgets, substantially increasing the robustness of the system and allowing for design flexibility. Using CDRs in multi-channel systems will also reset crosstalk budgets, an increasing concern at higher data rates.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Data Rate (Gbps)</th>
<th>Lanes</th>
<th>CDR</th>
<th>Ref Clock</th>
<th>Input Stage</th>
<th>De-emphasis</th>
<th>Supply (V)</th>
<th>Package</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN2402*</td>
<td>10.3125</td>
<td>4</td>
<td>Yes</td>
<td>Not Req.</td>
<td>Equalizer</td>
<td>Yes</td>
<td>3.3</td>
<td>QFN-44</td>
<td>nx10G Backplanes, 10G/40G Linecards, 10G/40G Active Cables</td>
</tr>
<tr>
<td>GN2404*</td>
<td>1.25–12.8</td>
<td>4</td>
<td>Yes</td>
<td>Req.</td>
<td>Adaptive Equalizer DFE</td>
<td>Yes</td>
<td>0.9, 1.8</td>
<td>BGA-144</td>
<td>&gt;nx10G Backplanes, 10G/40G Linecards, 10G-KR, 40G-KR4, 40G-CR4, Crosspoint Switching, CPRI</td>
</tr>
<tr>
<td>GN2405A/5S*</td>
<td>9.95–11.3</td>
<td>4</td>
<td>Yes</td>
<td>Not Req.</td>
<td>Equalizer</td>
<td>Yes</td>
<td>3.3</td>
<td>QFN-48</td>
<td>nx10G Backplanes 10G/40G Linecards 10G/40G Active Cables</td>
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<tr>
<td>GN2406/6S*</td>
<td>9.95–10.95</td>
<td>4</td>
<td>Yes</td>
<td>Not Req.</td>
<td>Limiting Amp</td>
<td>Yes</td>
<td>3.3</td>
<td>QFN-48</td>
<td>10G/40G Linecards</td>
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<td>GN2408*</td>
<td>1.25–12.8</td>
<td>8</td>
<td>Yes</td>
<td>Req.</td>
<td>Adaptive Equalizer DFE</td>
<td>Yes</td>
<td>0.9, 1.8</td>
<td>BGA-144</td>
<td>&gt;nx10G Backplanes, 10G/40G Linecards, 10G-KR, Crosspoint Switching, CPRI</td>
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<td>GN2412*</td>
<td>1.25–12.8</td>
<td>12</td>
<td>Yes</td>
<td>Req.</td>
<td>Adaptive Equalizer DFE</td>
<td>Yes</td>
<td>0.9, 1.8</td>
<td>BGA-144</td>
<td>&gt;nx10G Backplanes, 10G/40G/100G Linecards, 10G-KR, 40G-KR4, 40G-CR4, Crosspoint Switching, CPRI</td>
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<tr>
<td>GN2904*</td>
<td>25.6–28.1</td>
<td>4</td>
<td>Yes</td>
<td>Not Req.</td>
<td>Adaptive Equalizer DFE</td>
<td>Yes</td>
<td>1.8</td>
<td>QFN-54</td>
<td>25G/50G/100G Linecards, 2x28G Backplanes, 25G/50G/100G Active Copper Cables</td>
</tr>
<tr>
<td>GT1706*</td>
<td>1.25–14.5</td>
<td>6</td>
<td>Yes</td>
<td>Req.</td>
<td>Adaptive Equalizer DFE</td>
<td>Yes</td>
<td>0.9, 1.8</td>
<td>BGA-144</td>
<td>HD/3G/4K/8K Video Broadcast testing Fibre Channel/Infiniband/Ethernet Link Testing BER/Development</td>
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<tr>
<td>GX4002</td>
<td>9.9–11.3, 14.025</td>
<td>2</td>
<td>Yes</td>
<td>Not Req.</td>
<td>Equalizer</td>
<td>Yes</td>
<td>3.3</td>
<td>QFN-32</td>
<td>nx10G Backplanes, 10G/40G Linecards, Infini fabrics, 16G Fibre Channel, Crosspoint Switching</td>
</tr>
</tbody>
</table>

* Please contact your sales representative for more details.

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Optical Module Reference Design Kits

Improve the performance and time-to-market of your SFP+ design with Semtech Optical Module Reference Design Kits*.

**Fast Time-to-Market**
Semtech’s Reference Design Kits offer training through schematics, layout files and a design guide, as well as prompt support from our experienced applications engineers, reducing both design costs and time-to-market. This type of system is currently executed in the FTtx market, as the ability to reuse the 10G symmetric SFP+ design to address the 10G asymmetric market is incorporated.

**Broad Range of Reference Designs Available**
Reference Design Kits are offered to cover a wide variety of SFP+ applications, including symmetrical and asymmetrical PON, and 10GbE SR and LR applications.

For Ethernet SFP+, designs are available for both the traditional architecture (including a LA in the receive chain), as well as a new LA-free architecture enabled by Semtech’s High Gain ROSA portfolio.

*Reference design kits are available upon request. Please contact your semtech sales representative or through the link below.

For a detailed list of sales representatives in your area please visit semtech.com/sales

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