

2.5 Gbps High Sensitivity Transimpedance Amplifier with AGC

M02024

Low-power, high-sensitivity 2.5 Gbps TIA for GPON and OC48 applications

The M02024 transimpedance amplifier (TIA) with automatic gain control (AGC) is fabricated in sub-micron CMOS for high performance. The device targets a sensitivity of -29dBm, enabling the use of low cost PIN diodes to meet the GPON Class B+ standard.

In order to satisfy such high sensitivity and good optical overload requirements, automatic gain control (AGC) is implemented in the M02024. The AGC monitors the output amplitude and automatically reduces the TIA gain when the photodiode current exceeds the AGC threshold, maintaining the output at a constant level. With an input overload capability greater than +6 dBm, the AGC allows more than 35 dB of dynamic range, providing a low-cost solution for longer-reach 2.5 Gbps GPON/ATM/SONET systems that formerly required an APD. For even greater sensitivity, the M02024 may be used with an APD.

The TIA consists of a high gain single-ended CMOS amplifier with a feedback resistor. The feedback creates a virtual low impedance at the input, and nearly all of the input current passes through the feedback resistor, defining the voltage at the output. Advanced CMOS design techniques are employed to maintain the stability of this stage across all input conditions. An on-chip low dropout linear regulator has been incorporated into the design to give excellent noise rejection up to several MHz.

Key Features

- > -29 dBm Sensitivity
- > Data rates to 2.5 Gbps
- > Integrated filter, eliminates need for a capacitor on the photodiode cathode
- > AGC provides dynamic range of 35 dB
- > +6 dBm Input overload
- > Photodiode current monitor
- > Internal or external bias for photodiode
- > Single +3.3V supply
- > Same pad layout and die size as M02011/13/14/15/16

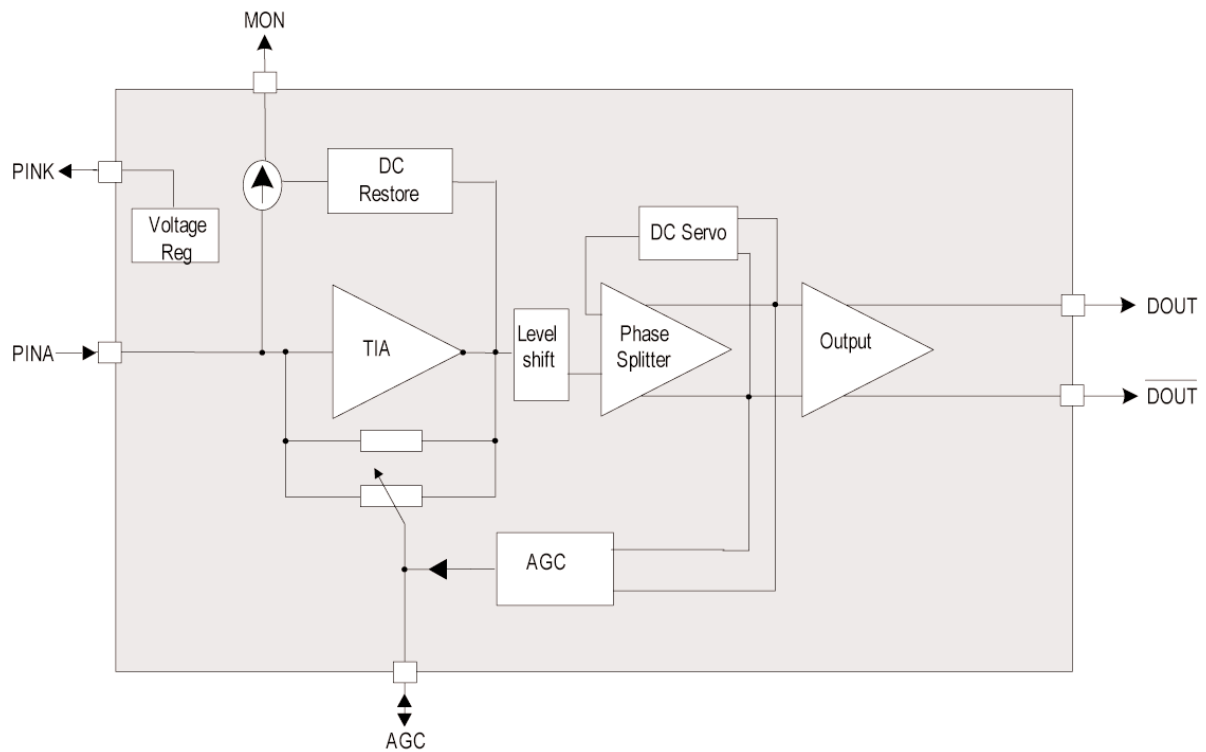
Higher frequency noise is removed by the integrated filter, eliminating the need for an external capacitor on the photodiode cathode.

The circuit is intended to be configured for use with PIN photodiodes in the “grounded cathode” configuration with the anode connected to the input of the TIA and the cathode connected to the PINK terminal. The PINK terminal provides ~2V reverse DC bias to reduce the photodiode capacitance. Operation with an external photodiode bias supply is also possible, as required by avalanche photodiodes.

A replica of the average photodiode current is available at the MON pad for photo-alignment, monitoring average power and 'Loss of Signal' detection.

For optimum system performance, the M02024 die should be mounted with the photodetector inside a lensed TO-Can or other optical sub-assembly.





M02024 Functional Block Diagram

Key Features

- -29dBm sensitivity, >+6 dBm saturation at 2.5 Gbps
- Bandwidth 1.65 Ghz (Typical)
- Overload of +6 dBm
- Typical differential transimpedance: 48K Ω
- Differential 100 Ω output impedance
- Operates on a single 3.3V supply
- Monitor output
- AGC provides dynamic range of more than 35 dB

Applications

- GPON Class B+ application with a low cost PIN diode
- SONET OC-48
- PCI Express
- Infiniband
- GEAPON/ GPON, multi-rate applications

Ordering Information

- M02024-11: waffle pack
- M02024-12: wafer