

622Mbps Transimpedance Amplifier with AGC

M02011

Low-power, high-sensitivity, 622Mbps transimpedance amplifier fabricated in sub-micron CMOS

The M02011 transimpedance amplifier (TIA) with automatic gain control (AGC) is fabricated in sub-micron CMOS for high performance. With typical transimpedance of 66k ohms differential and input-referred noise of 56na, sensitivities of -34 dbm are achievable. With an input overload capability greater than 6ma p-p, the AGC allows more than 40 dB of dynamic range, providing a low-cost solution for longer-reach 622Mbps APON, BPON and OC-12 systems.

For optimum system performance, the M02011 die should be mounted with a silicon or InGaAs PIN photodetector inside a lensed TO-Can or other optical sub-assembly.

Transimpedance Amplifier (TIA)

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. Higher frequency power supply noise is removed by the external 470 pF decoupling capacitor connected to PINK.

KEY FEATURES

- > Typical -34 dBm sensitivity, > +6 dBm saturation at 622 Mbps
- > Bandwidth 600 Mhz (typical)
- > Input-referred noise of 56na (typical)
- > Overload of 8ma p-p
- > Typical differential transimpedance: 66kΩ
- > Maximum jitter of 100 ps p-p
- > Differential 100Ω output impedance
- > Operates on a single 3.3V supply
- > Monitor output
- > AGC provides dynamic range of more than 40 dB

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 a ~2.6V reverse DC bias to reduce the photodiode capacitance. Operation with an external bias supply to a higher potential than 2.6V is possible, as required by avalanche photodiodes.

Automatic Gain Control (AGC)

The M02011 has been designed to operate over the input range of +6 dBm to -34 dBm @ 622Mbps. The AGC operates on signals greater than ~ 3.5ua p-p. The AGC pad allows the AGC to be disabled during photodiode alignment by grounding the pad through a low impedance. The AGC



control voltage can be monitored during normal operation at this pad by a high impedance (>10 M Ω) circuit. A control voltage can drive the AGC pad, locking the gain to a certain value if desired.

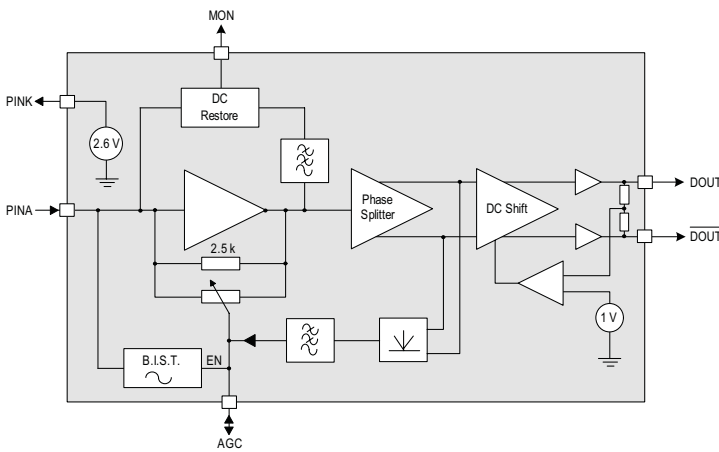
Output Stage

The signal from the TIA enters a phase splitter followed by a DC-shift stage and a pair of voltage follower outputs. These are designed to drive a differential (100 Ω) load. They are stable for driving capacitive loads, such as interstage filters.

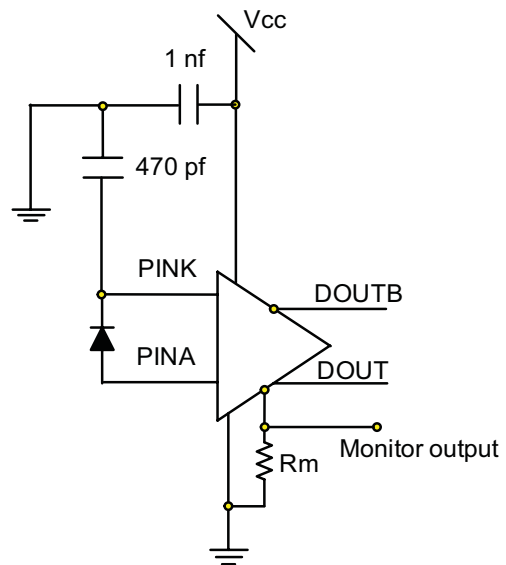
Each output has its own GND pad, all four GND pads on the chip should be connected for proper operation. Since the M02011 exhibits rapid roll-off (3 pole), simple external filtering is sufficient.

Monitor O/P

High impedance output mirrors the average photodiode current for monitoring purposes. The current mirror sources current. Connecting a 1k ohm resistor to ground, allows direct voltage measurement.



M02011 Block Diagram



Recommended Circuit

Product Highlights

Applications

- APON, BPON
- OC-12

Ordering Information

- M02011-A3: waffle pack (WP)
- M02011-QSPBG: quarter wafer

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