ATA30013

Transimpedance Amplifier
SONET OC- 48

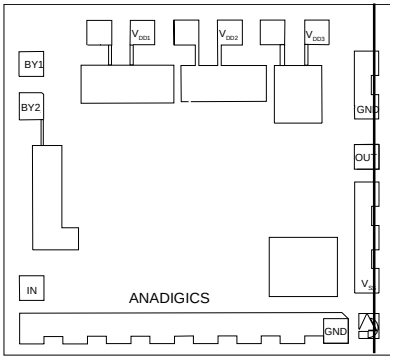
PRELIMINARY DATA SHEET - Rev 2

FEATURES

- 3K Ω Transresistance
- Low Noise: < 3pA/√ Hz
- 2 GHz Analog Bandwidth
- Wide Dynamic Range
- Good Sensitivity and High Bit Rates
- Low Distortion

APPLICATIONS

- SONET OC-48 /SDH STM-16 (2.488 Gb/s) Receiver
- Wideband Gain Block
- Low Noise RF Amplifier



D1
Die Package

PRODUCT DESCRIPTION

The ANADIGICS ATA30013 is a ±5V high speed, low noise transimpedance amplifier designed to be used in OC-48/STM-16 fiber optic links. The device is used in conjunction with a photodetector (PIN diode or avalanche photodiode) to convert an optical signal into an output voltage. The ATA30013 offers a bandwidth of 2GHz and a wide linear range of operation. It is manufactured in a GaAs MESFET process and is available in bare die form.

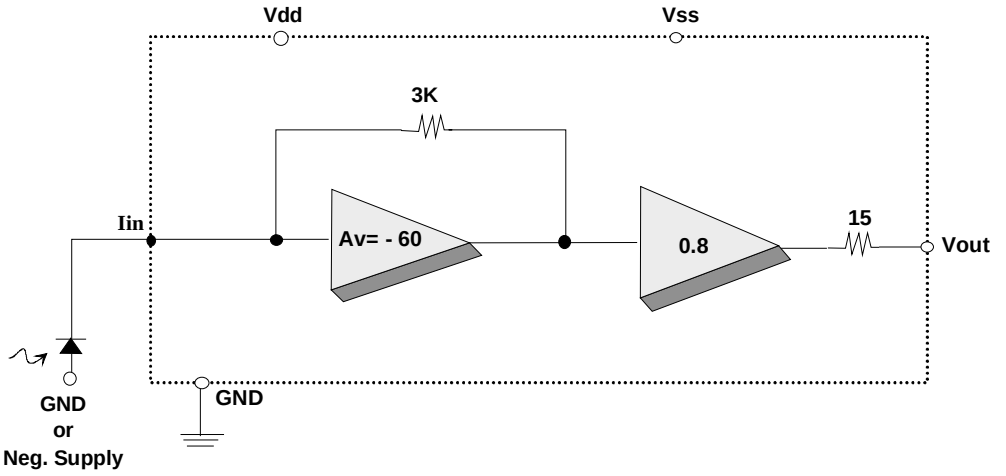


Figure 1: Pad Description

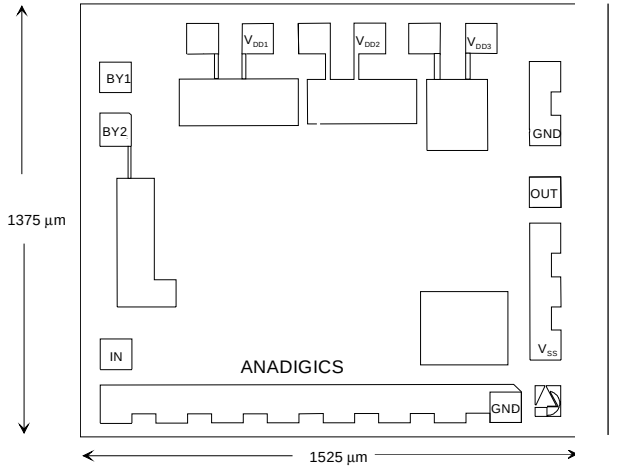


Figure 2: Bond Pad Layout

Table 1: Pad Description

PAD	DESCRIPTION	COMMENT
V_{DD1}	Positive supply voltage	
V_{DD2}	Positive supply voltage	
V_{DD3}	Positive supply voltage	
V_{SS}	Negative supply voltage	
I_{IN}	TIA Input Current	
V_{OUT}	TIA Output Voltage	Requires external DC block

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Maximum Ratings

V_{DD}	7.0V
T_A	Operating Temp. - 40 °C to 125 °C
T_S	Storage Temp. - 65 °C to 150 °C

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Table 3: DC Electrical Specifications

Electrical Specifications: (T_A = 25 °C, V_{dd} = + 5 V, V_{ss} = - 5V, C_{diode} + C_{stray} = 0.4 pF)

DC CHARACTERISTICS	MIN	TYP	MAX	UNIT
Transresistance (R_L =∞)	2.5	2.9	3.2	KΩ
Input Impedance		50		Ω
Supply Current V_{DD} V_{SS}	70	100 70	140 90	mA mA
Output Drive Current Source/Sink		10		mA
Output Offset Voltage		+0.1		V
Input Bias Voltage	- 0.8	- 0.6	- 0.1	V
Operating Temperature Range	0		+ 85	°C
Operating Voltage Range V_{DD} V_{SS}	4.5 -6	5.0 -5	6.0 -4	V V

Table 4: AC Electrical Specifications

AC CHARACTERISTICS	MIN	TYP	MAX	UNIT
Transresistance f = 300 MHz R_L = 50Ω	1.4	1.8	2.3	KΩ
Input Capacitance		0.6		pF
3 dB Bandwidth		2		GHz
Output Impedance	10	15	30	Ω
Input Noise Current, 150 KHz - 1 GHz 1 GHz - 2.5 GHz		165 400	230 600	nA RMS nA RMS
Gain Flatness (150 KHz - 500 MHz)		± 0.5	±1	dB
Peaking (Relative to 100 MHz)		1.5	2.5	dB
Input 1 dB Compression (100 Mb/s)	500	600		μAp-p

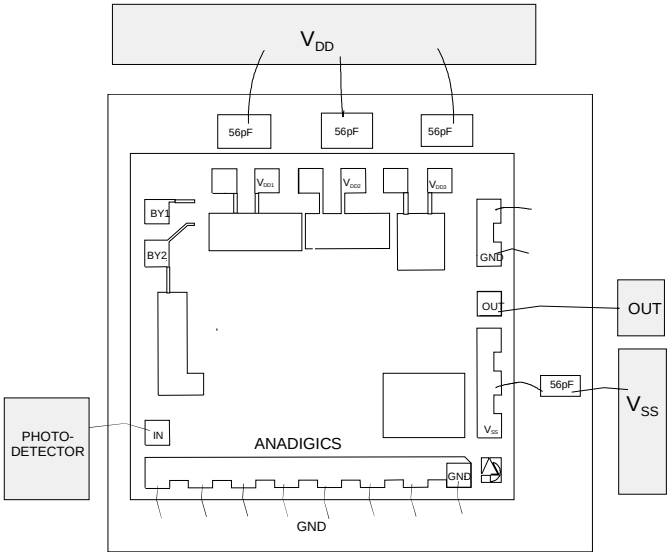


Figure 3: Bonding Diagram

APPLICATION INFORMATION

V_{out} Connection

The output pad should be connected via a coupling capacitor to the next stage of the receiver (filter or decision circuits), as the output buffers are not designed to drive a DC coupled 15 ohm load. If V_{out} is connected to a high input impedance decision circuit (>500Ω), then a coupling capacitor may not be required, although caution should be exercised since DC offsets of the photo detector/TIA combination may cause clipping of subsequent gain or decision circuits.

Power Supplies And General Layout Considerations

The ATA30013 may be operated from a positive supply as low as + 4.5 V and as high as + 6.0 V. Below + 4.5 V, bandwidth and sensitivity will degrade, while at + 6.0 V, bandwidth, and sensitivity improve. The device is much less sensitive to the same changes in Vss. Use of surface mount (preferably MIM type capacitors), low inductance power supply bypass capacitors (>=56pF) are essential for good high frequency and low noise performance. The power supply bypass capacitors should be mounted on or connected to a good low inductance ground plane.

General Layout Considerations

Since the gain stages of the transimpedance amplifier have an open loop bandwidth in excess of 2.0 GHz, it is essential to maintain good high frequency layout practices. To prevent oscillations, a low inductance RF ground plane should be made available for power supply bypassing. Traces that can be made short should be made short, and the utmost care should be taken to maintain very low capacitance at the photodiode-TIA interface (I_{in}), as excess capacitance at this node will cause a degradation in bandwidth and sensitivity.

Sensitivity and Bandwidth

In order to guarantee sensitivity and bandwidth performance, the TIA is subjected to an extensive series of tests at the die sort level (100% testing at 25°C) to verify the DC parametric performance and the high frequency performance (i.e. adequate $|S21|$) of the amplifier. Acceptably high $|S21|$ of the internal gain stages will ensure low amplifier input capacitance, and hence, low input reference noise current. Transimpedance sensitivity and bandwidth are then guaranteed by design and correlation with RF and DC die sort test results.

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ORDERING INFORMATION

Part Number	Package Option	Package Description
ATA30013D1C	D1	Die

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