11.1 Gbps 3.3V Transimpedance Amplifier

Preliminary Technical Data

ADN2821

FEATURES

Bandwidth: 8 GHz min
Input Noise Current Density: 12pA√Hz
Optical sensitivity: –19 dBm[1]
Differential Transimpedance /Linear Range:
ADN2821_2: 2.0 kΩ/0.20 mA p-p
ADN2821_5: 5.0 kΩ/0.08 mA p -p
ADN2821_10: 10.0 kΩ/0.04 mA p-p
Power Dissipation: 150 mW
Differential Output Swing: 400 mV p-p min
Input Overload: 3.25 dBm @ 10 dB ER
Low-F cutoff:
ADN2821_10: 25 kHz w/C_{LF} = 0.5 nF
On-Chip PD filter: R_F = 200 Ω, C_F = 20 pF
Die Size: 0.65 mm × 1.20 mm

APPLICATIONS

10.7 Gbps Optical Modules
SONET/SDH OC-192/STM-64 and 10 GbE
Receivers, Transceivers, Transponders

PRODUCT DESCRIPTION

The ADN2821_2/5/10 are a series of compact, high performance SiGe 3.3V power supply Trans-impedance Amplifiers (TIAs) optimized for small form factor 10Gbps Metro-Access and Ethernet PD-TIA modules. The ADN2821 series features low input referred noise current and a range of trans-impedance gains, suitable for driving a typical CDR or transceiver directly. 8GHz minimum BW enables up to 11.1Gbps operation; 1.1µA input referred noise current enables –19dBm sensitivity; 3.25dBm input overload current at a 10dB extinction ratio. For assembly in small form factor packages, the ADN2821 series integrates a photodiode filter R_FC_F network on chip and features 25kHz low frequency cutoff with small 0.5nF external capacitor The ADN2821 operates with a 3.3V ±0.3V power supply and is available in die form.

[1] 10^{-12} BER, 10 dB extinction ratio, 0.85 A/W PD responsivity.

FUNCTIONAL BLOCK DIAGRAM

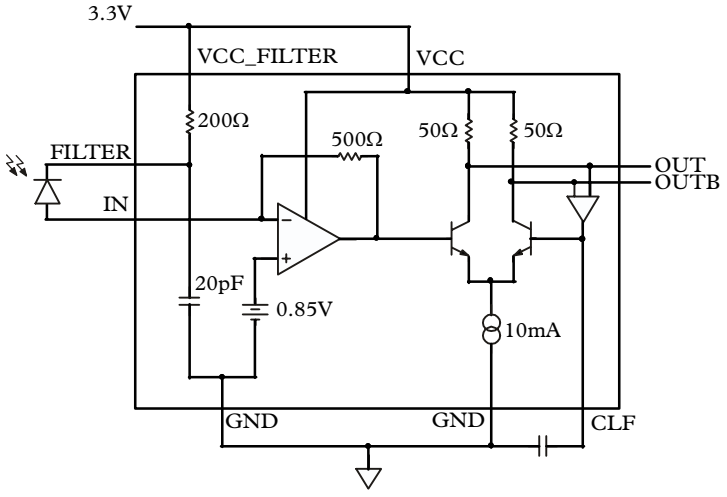

Figure 1. ADN2821 Block Diagram.

Rev. PrK

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TABLE OF CONTENTS

REVISION HISTORY

Revision PrK: Preliminary Version

ELECTRICAL SPECIFICATIONS

Table 1.

Parameter	Conditions[1]	Min	Typ	Max	Units
DYNAMIC PERFORMANCE					
Bandwidth (BW)[2]	−3 dB	8	9.5		GHz
Total Input RMS Noise (I_{RMS})[2]	DC to 10GHz		1.1	1.3	µA
Small Signal Trans-impedance (T_Z)	ADN2821_2, 100 MHz	1500	2000	2500	V/A
	ADN2821_5, 100 MHz	3500	5000	6500	V/A
	ADN2821_10, 100 MHz	6000	10000	15000	V/A
Trans-impedance Ripple[2]	50 MHz to 5 GHz		±1		dB
Group Delay Variation[2]	50 MHz to 8 GHz		±10		ps
Low Frequency Cut-Off	ADN2821_10, C_{LF} = 500 pF		15	25	kHz
Output Return Loss[2]	DC to 8 GHz, differential		−12	−10	dB
Total pk-pk Jitter[2]	$I_{IN,PK-PK}$ = 2.0 mA, 4 dB ER		5	TBD	ps
Input Overload Current[3, 2]	Pav, 10^{-12} BER, 10 dB ER	TBD	3.25		dBm
Maximum Output Swing	p-p diff, $I_{IN,PK-PK}$ = 2.5mA	400	520	650	mV
Linear Output Range	p-p, < 1 dB gain compression		400		mV
Power Supply Noise Rejection	<10MHz		TBD		dB
DC PERFORMANCE					
Power Dissipation	$I_{IN,AVE}$ = 0.1 mA, Vcc = 3.3 V ± 5%		150	200	mW
Input Voltage		0.75	0.85	1.00	V
Output Impedance	single-ended	45	50	55	Ω
PD FILTER Resistance	R_F	180	200	220	Ω
PD FILTER Capacitance	C_F		20		pF

[1] Min/Max Vcc = +3.3V ± 0.3V, T_a = −40°C to +95°C; Typ Vcc = 3.3V, $T_{ambient}$ = +25C

[2] Photodiode capacitance C_D = 0.22pF ± 0.04pF, Photodiode resistance = 15Ω, C_B = 100pF Bond inductance L_{IN} = L_{FILTER} = 0.3nH ± 0.1nH; L_{OUT} = L_{OUTB} = 0.5nH ± 0.1nH Load impedance = 50Ω (each output, AC coupled)

[3] 10^{-12} BER, 10dB extinction ratio, 0.85 A/W PD responsivity

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage (Vcc to Gnd)	5V
Internal Power Dissipation	
Output Short Circuit Duration	Indefinite
Maximum Input Current	10 mA
Storage Temperature Range	−65°C to +125°C
Operating Ambient Temperature Range	−40°C to +95°C
Maximum Junction Temperature	+165°C
Die Attach Temperature (<60 seconds)	+450°C

Stresses above those listed under 'Absolute Maximum Rating' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

PAD DESCRIPTIONS

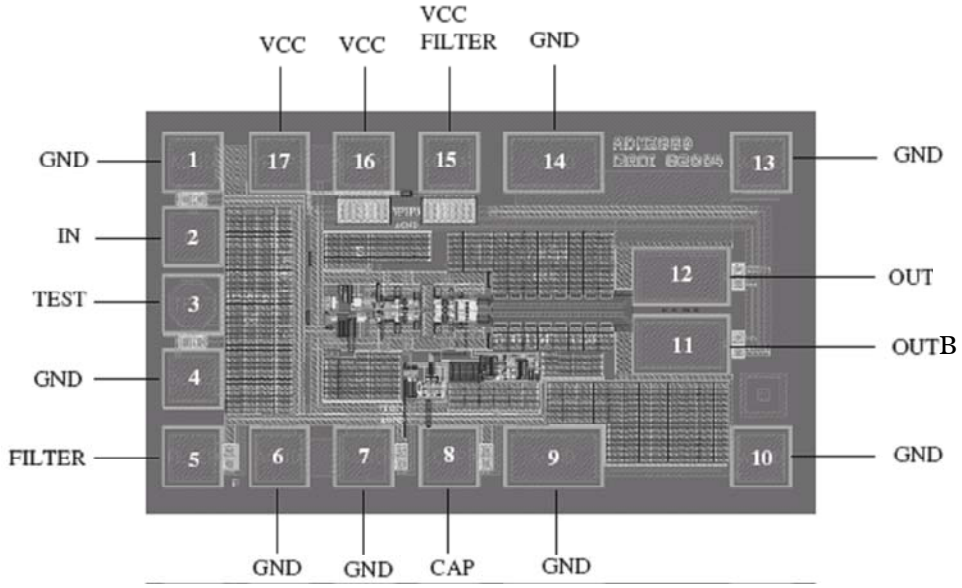

Table 3.

Pad No.	Pad	Function
1	GND	Ground (input return)
2	IN	Current input. Bond directly to PD anode.
3	TEST	Test probe Pad. Leave Floating.
4	GND	GND probe Pad. Leave Floating.
5	FILTER	Filter Output. Bond directly to PD cathode.
6	GND	Ground
7	GND	Ground
8	CAP	Low Frequency set point. Connect with .5nF capacitance to GND for <30kHz
9	GND	Ground
10	GND	Ground (output return)
11	OUTB	Negative Output. Drives 50 ohm termination (AC or DC termination)
12	OUT	Positive Output. Drives 50 ohm termination (AC or DC termination)
13	GND	Ground (output return)
14	GND	Ground
15	VCCFILTER	Filter Supply. Connect to Vcc to enable on-chip 200 ohm*20pf Filter.
16	VCC	3.3 V positive Supply. Recommended bypass to GND is 100 pF RF capacitor.
17	VCC	3.3 V positive Supply. Recommended bypass to GND is 100 pF RF capacitor.

PAD LAYOUT

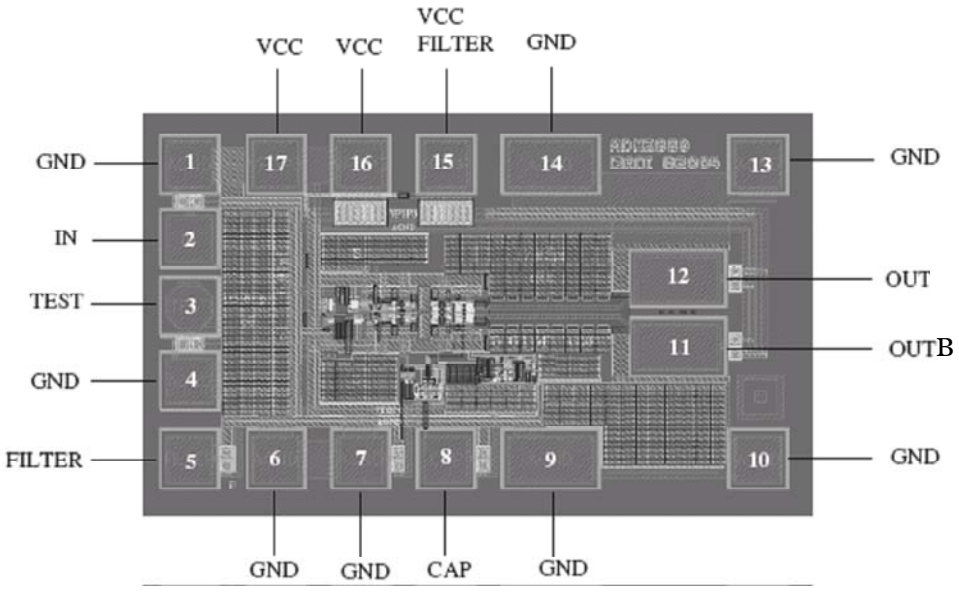

Figure 2.. Pad Layout

PAD COORDINATES

Table 4.

PAD #	PAD	X (um)	Y (um)
1	GND	−500	260
2	IN	−500	130
3	TEST	−500	10
4	GND	−500	−120
5	FILTER	−500	−260
6	GND	−350	−260
7	GND	−200	−260
8	CAP	−50	−260
9	GND	130	−260
10	GND	500	−260
11	OUTB	350	−60
12	OUT	350	60
13	GND	500	260
14	GND	130	260
15	VCCFILTER	−50	260
16	VCC	−200	260
17	VCC	−350	260

DIE INFORMATION

Die Size

0.7mm × 1.2mm

(edge-edge including 1mil scribe)

Die Thickness

10mils = 0.25mm

Passivation Openings

0.075 mm × 0.075 mm

(pads 1-8, 9, 10, 13, 15, 16, 17)

0.144mm × 0.075mm

(pads 9, 11, 12, 14)

Passivation Composition

5000Å Si_3N_4 (top)

+5000 Å SiO_2 (bot)

Pad Composition

Al/1%Cu

Backside Contact

ASSEMBLY RECOMMENDATIONS

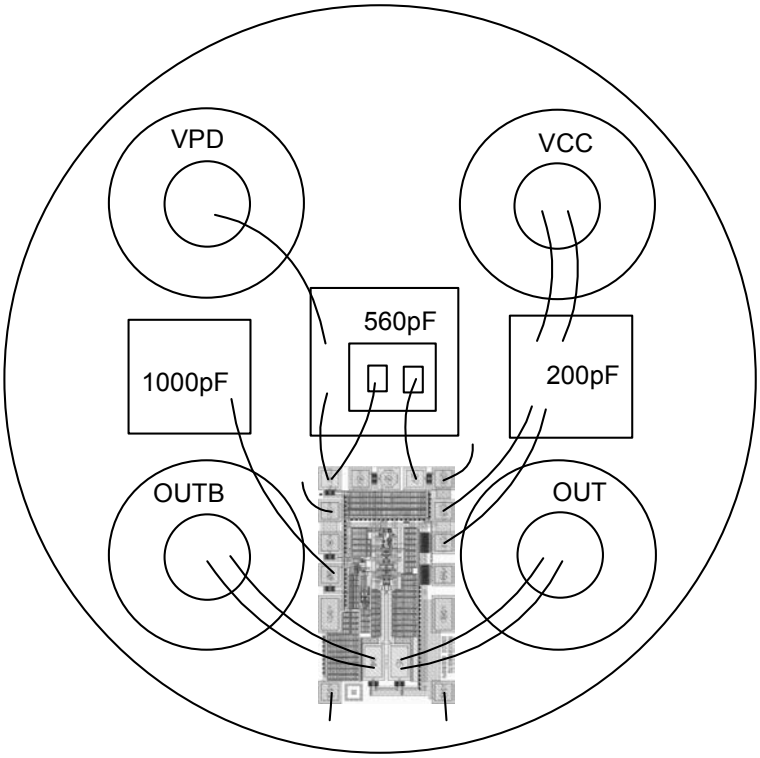

Figure 3. 5-Pin TO-46 w/External Photodiode Supply V_{PD}

- 1× VENDOR SPECIFIC (0.3mm × 0.3mm) 10.0Gbps Photo Diode
- 1× ADN2821 (0.7mm × 1.2mm) Analog Devices SiGe 10.0Gbps Trans-Impedance Amplifier
- 200pF RF Single Layer Capacitor
- 560pF RF Single Layer Capacitor
- 1000pF Ceramic Cap

Notes:

1. Minimize all GND bond wire lengths.
2. Minimize IN, FILTER, OUT and OUTB bond wire lengths.
3. Maintain symmetry in length and orientation between IN and FILTER bond wires.
4. Maintain symmetry in length and orientation between OUT and OUTB bond wires.
5. Maintain symmetry between IN/FILTER and OUT/OUTB bond wires.

ORDERING GUIDE

Model	Temperature	Package Description	Package Option
ADN2821XCHIP-02KWP	-40°C to 95°C	NA	Tested Die
ADN2821XCHIP-05KWP	-40°C to 95°C	NA	Tested Die
ADN2821XCHIP-10KWP	-40°C to 95°C	NA	Tested Die

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