

FEATURES

Technology: High performance SiGe
Bandwidth: 9 GHz
Input noise current density: 11 pA/ $\sqrt{\text{Hz}}$
Optical sensitivity: -19.3 dBm
Differential transimpedance: 5000 V/A
Power dissipation: 200 mW
Input current overload: 2.5 mA p-p
Linear input range: 0.12 mA p-p
Output resistance: 50 Ω /side
Output offset adjustment range: ± 120 mV
Average input power monitor: 1 V/mA
Die size: 0.87 mm \times 1.06 mm

APPLICATIONS

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

PRODUCT DESCRIPTION

The ADN2820 is a compact, high performance, 3.3 V power supply SiGe transimpedance amplifier (TIA) optimized for 10 Gbps Metro-Access and Ethernet systems. It is a single chip solution for detecting photodiode current with a differential output voltage. The ADN2820 features low input referred noise current and high output transimpedance gain, capable of driving a typical CDR or transceiver directly. A POWMON output is provided for input average power monitoring and alarm generation. Low nominal output offset enables dc output coupling to 3.3 V circuits. The OFFSET control input enables output slice level adjustment for asymmetric input signals. The ADN2820 operates with a 3.3 V power supply and is available in die form.

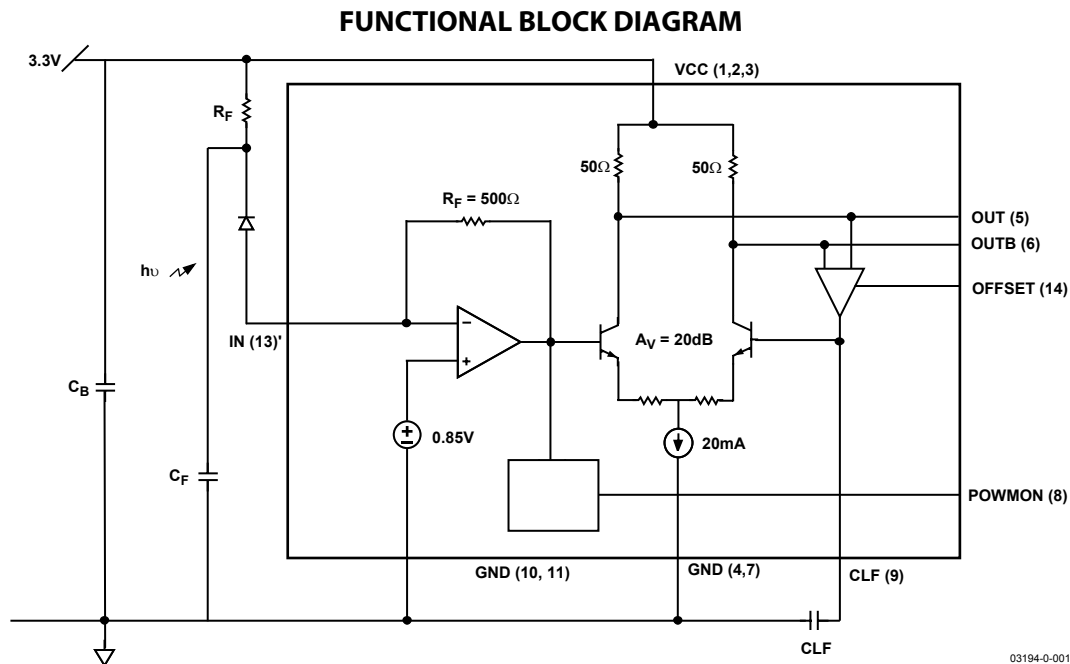


Figure 1. Functional Block Diagram/Typical Operating Circuit

Rev. PrB

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SPECIFICATIONS

Table 1. Electrical Specifications

Parameter	Conditions ¹	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
Bandwidth ²	-3 dB	7.5	9		GHz
Total Input RMS Noise ²	DC to 9 GHz		1.05		μA
Small Signal Transimpedance	100 MHz	4000	5000	6000	V/A
Transimpedance Ripple ²	100 MHz to 3 GHz		±0.5		dB
Group Delay Variation ²	100 MHz to 3 GHz		±10		ps
	100 MHz to 9 GHz		±30		ps
Total Peak-to-Peak Jitter ^{2,3}	$I_{IN,P-P} = 2.5$ mA		TBD		ps
Low Frequency Cutoff	$C_{LF} = 0.1$ μF		20		kHz
Output Return Loss ²	DC-9 GHz, differential		-12	-10	dB
Linear Input Range	Peak-to-peak, <1 dB compression		0.12		mA
Input Overload Current ^{2,3}	Peak-to-peak	2.0	2.5		mA
Maximum Output Swing	Peak-to-peak differential, $I_{IN,P-P} = 2.0$ mA	TBD	1		V
DC PERFORMANCE					
Power Dissipation			200	TBD	mW
Input Voltage			0.85	1.00	V
Output Common-Mode Voltage	DC terminated to V_{CC}		$V_{CC} - 0.3$		V
Output Offset	$I_{IN,AVE} < 0.1$ mA	-10		+10	mV
Offset Adjust Sensitivity	0.8 V < $V_{OFFSET} < 2.8$ V		120		mV/V
Offset Adjust Range	0.8 V < $V_{OFFSET} < 2.8$ V		±120		mV
POWMON Sensitivity	$I_{IN,AVE} = 10$ μA to 1 mA	0.95	1	1.25	V/mA
POWMON Offset	$I_{IN,AVE} = 0$ μA		10		mV

¹ Min/Max $V_{CC} = 3.3$ V ± 0.3 V, $T_{AMBIENT} = -15^{\circ}\text{C}$ to $+85^{\circ}\text{C}$; Typ $V_{CC} = 3.3$ V, $T_{AMBIENT} = 25^{\circ}\text{C}$.

² Photodiode capacitance $C_D = 0.22$ pF ± 0.04 pF; photodiode resistance = 20 Ω; $C_B = C_F = 100$ pF; $R_F = 100$ Ω; input wire bond inductance $L_{IN} = 0.5$ nH ± 0.15 nH; output bond wire inductance $L_{OUT,OUTB} = 0.85$ nH ± 0.15 nH; load impedance = 50 Ω (each output, dc- or ac-coupled).

³ 10^{-12} BER, 8 dB extinction ratio, 0.85 A/W PIN responsivity.

ABSOLUTE MAXIMUM RATINGS

Table 2. ADN2820 Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{CC} to GND)	TBD
Internal Power Dissipation	
Output Short Circuit Duration	Indefinite
Maximum Input Current	TBD
Storage Temperature Range	-65°C to +125°C
Operating Ambient Temperature Range	-15°C to +85°C
Maximum Junction Temperature	165°C
Die Attach Temperature (<60 seconds)	450°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; 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.

PAD COORDINATES

Table 3. Pad Coordinates

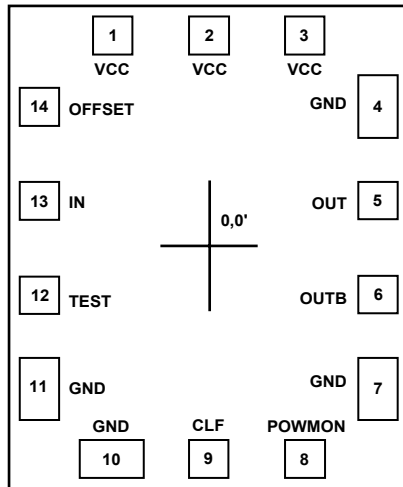
Pin No.	PAD	X (mm)	Y (mm)
1	VCC	-0.20	0.45
2	VCC	0.00	0.45
3	VCC	0.20	0.45
4	GND	0.35	0.30
5	OUT	0.35	0.10
6	OUTB	0.35	-0.10
7	GND	0.35	-0.30
8	POWMON	0.20	-0.45
9	CLF	0.00	-0.45
10	GND	-0.20	-0.45
11	GND	-0.35	-0.30
12	TEST	-0.35	-0.10
13	IN	-0.35	0.10
14	OFFSET	-0.35	0.30

PAD DESCRIPTIONS

Table 4. Pad Descriptions

Pin No.	Pad	Function
1-3	VCC	Positive Supply. Bypass to GND with a 100 pF or greater single-layer capacitor.
4, 7, 10, 11	GND	Ground.
5	OUT	Positive Output. Drives 50 Ω termination (ac or dc termination).
6	OUTB	Negative Output. Drives 50 Ω termination (ac or dc termination).
8	POWMON	Input Average Power Monitor. Analog signal proportional to average optical input power. Leave open if unused.
9	CLF	Low Frequency Cutoff Setpoint. Connect with a 0.1 μ F capacitor to GND for 20 kHz.
12	TEST	Test Pad. Leave Floating.
13	IN	Current Input. Bond directly to reverse biased PIN or APD anode. Filter PIN or APD anode with 100 pF \times 100 Ω or greater.
14	OFFSET	Output Offset Adjust Input. Leave open if not being used and the input slice threshold will automatically be set to the eye center.

PAD LAYOUT



03194-0-002

Figure 2. ADN2820 Pad Layout

DIE INFORMATION

Die Size

0.875 mm × 1.060 mm

Die Thickness

12 mils = 0.3 mm

Passivation Openings

0.08 mm × 0.08 mm

0.12 mm × 0.08 mm

0.08 mm × 0.12 mm

Passivation Composition5000 Å Si₃N₄ (Top)+5000 Å SiO₂ (Bottom)**Pad Composition**

Al/1% Cu

Backside Contact

P-Type Handle (Oxide Isolated from Active Circuitry)

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 the ADN2820 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.

