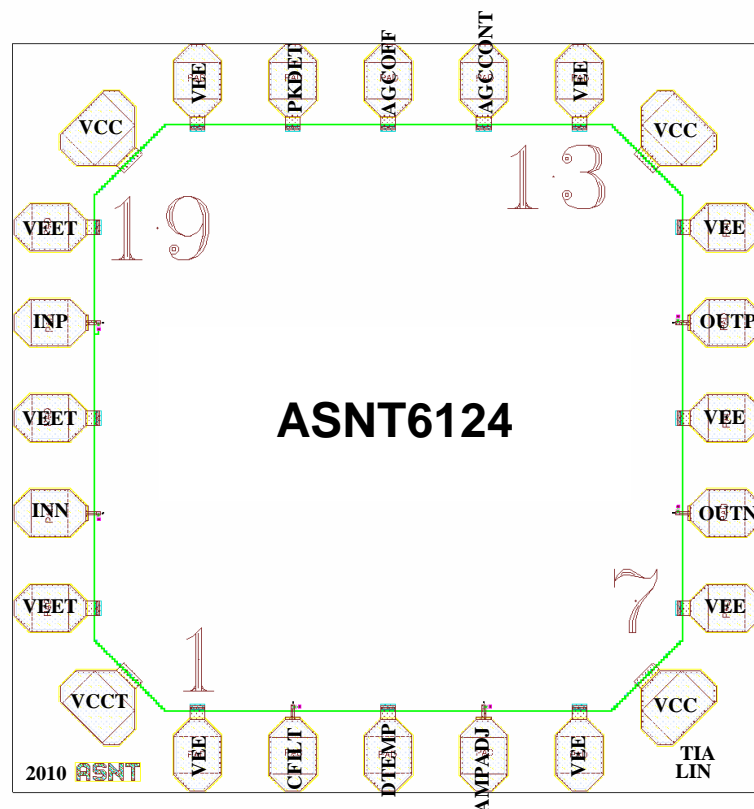




ASNT6124-BD 28Gbps TIA with Linear Output

- Broadband transimpedance amplifier (TIA) for low noise receiver-side applications
- Automatic and/or manual output amplitude control
- Automatic DC offset adjustment
- Input peak detector
- On-chip temperature detector
- Exhibits low jitter and limited temperature variation over industrial temperature range
- Fully differential input and output buffers with on-chip 50 Ω termination
- Single +3.3V or -3.3V power supply
- Low current consumption of 240mA at nominal conditions
- Fabricated in SiGe for high performance, yield, and reliability





DESCRIPTION

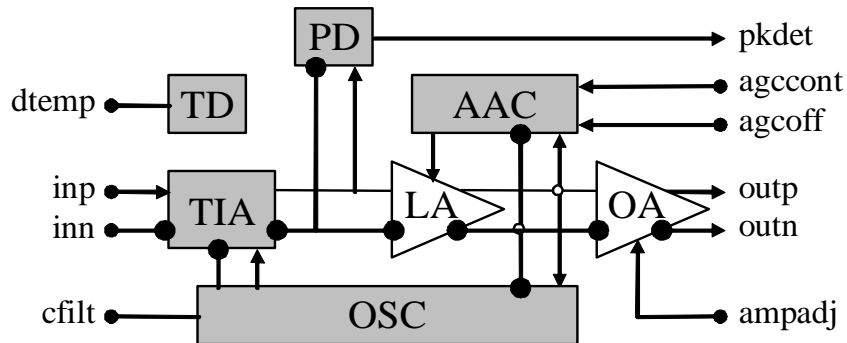


Fig. 1. Functional Block Diagram

The ASNT6124-BD SiGe IC is a temperature stable SiGe transimpedance amplifier that provides low-jitter broadband linear conversion of current signals at its input ports (**inp/inn**) into differential voltage signals at the output ports (**outp/outn**). The part shown in Fig. 1 is a serial combination of transimpedance (TIA), linear (LA), and output (OA) amplification stages. The input signal should be single-ended with the current flowing into or out of the corresponding used pin. It is recommended to supply a current equal to the photo diode dark current into the unused input pin. The part incorporates an automatic DC offset control (OSC) that effectively eliminates any difference between the common-mode voltages of direct and inverted output signals. OSC requires utilization of an external $30nF$ capacitor attached to **cfilt** pad.

The amplitude of the output signal can be manually adjusted between its minimum and maximum values using the **ampadj** control input. The output amplitude can be stabilized by the Automatic Amplitude Control block which is activated by setting the control signal **agcoff** to logic "0" state. In this operational mode, the amplitude can be also additionally adjusted through control input **agccont**.

The on-chip peak detector (PD) provides an output signal **pkdet** proportional to the value of the input signal.

The on-chip temperature sensor is a diode with its anode connected to the **dtemp** port.

The part's outputs support a CML-type interface with on-chip 50Ω termination and may be used as a differential or single-ended connection with AC or DC-coupling (see also POWER SUPPLY CONFIGURATION). The input and output termination resistors in both channels are respectively connected to separate internal positive supply planes **vcct** and **vcc**. The input and output negative supply nets are also created as separate metal planes **veet** and **vee**, which are partly shorted through the common substrate.

POWER SUPPLY CONFIGURATION

The part can operate with either negative supply (**vcc** = $0.0V$ = ground and **vee** = $-3.3V$), or positive supply (**vcc** = $+3.3V$ and **vee** = $0.0V$ = ground). In case of the positive supply, all I/Os need AC termination when connected to any devices with 50Ω termination to ground.

The chip substrate should be connected to **vee** or completely isolated. DO NOT connect substrate to **vcc**!



All the characteristics detailed below assume $V_{CC} = 3.3V$ and $V_{EE} = 0.0V$.

ABSOLUTE MAXIMUM RATINGS

Caution: Exceeding the absolute maximum ratings shown in Table 1 may cause damage to this product and/or lead to reduced reliability. Functional performance is specified over the recommended operating conditions for power supply and temperature only. AC and DC device characteristics at or beyond the absolute maximum ratings are not assumed or implied. All min and max voltage limits are referenced to ground (assumed V_{EE}).

Table 1. Absolute Maximum Ratings

Parameter	Min	Max	Units
Supply Voltage (V_{CC})		3.6	V
Power Consumption		0.87	W
RF Input Current Swing (SE)		1	mA
Junction Temperature		+125	$^{\circ}C$
Storage Temperature	-40	+100	$^{\circ}C$
Operational Humidity	10	98	%
Storage Humidity	10	98	%

TERMINAL FUNCTIONS

TERMINAL			DESCRIPTION
Name	No.	Type	
High-Speed I/Os			
inp	20	Current input	Single-ended current-sensing data inputs
inn	22		
outp	10	CML output	Differential data outputs. Require external SE 50 Ω termination to V_{CC}
outn	8		
Controls			
agcoff	15	Digital input	CMOS-type control port
agcont	14	Input	Analog control port with internal high-impedance termination
ampadj	4		
pkdet	16	Output	Analog voltage port with internal 2.8K Ω termination to V_{CC}
cfilt	2		30nF off-chip capacitor connection
dtemp	3	Output	Temperature sensor output (sink current)
Supply and Termination Voltages			
Name	Description		Pin Number
vcc	Positive power supply (+3.3V or 0V)		6, 12, 18
vcct	Quiet positive power supply for TIA (+3.3V or 0V)		24
vee	Negative power supply (0V or -3.3V)		1, 5, 7, 9, 11, 13, 17
veet	Quiet negative power supply for TIA (0V or -3.3V)		19, 21, 23



ELECTRICAL CHARACTERISTICS

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
General Parameters					
vcc	3.1	3.3	3.5	V	±6%
vcct	3.1	3.3	3.5	V	±6%
vee		0.0		V	External ground
veet		0.0		V	External ground
I _{vee}		235		mA	
Power consumption		776		mW	
Junction temperature	-25	50	125	°C	
HS Input Data (inp/inn)					
Data Rate	DC		28	Gbps	
Bandwidth	17		22	GHz	-3dB level
SE Current Swing	30	300	500	µA	Positive (into the pin)
CM Current Level		15		µA	Negative (out of the pin)
Input CMOS-Type Control (agcoff)					
Frequency		DC			
Logic "0" level	vee	vee+0.2		V	
Logic "1" level	vee+2.3	vee+2.5		V	
Analog Controls (ampadj, agccont)					
Voltage range	vcc-1.0		vcc	V	For linear amplitude control
HS Output Data (outp/outn)					
Data Rate	DC		28	Gbps	
SE Swing	0.15		0.45	V	Peak-to-peak
CM Level		vcc-0.415		V	With external 50Ω DC termination
Rise/Fall Times		12		ps	20%-80%
Additive Jitter		TBD		ps	Peak-to-peak

DIE INFORMATION

The main dimensions of the die are given in Table 2.

Table 2. Important Die Dimensions

Pad metal dimensions	80µm x 80µm
Pad opening dimensions	74µm x 74µm
Die dimensions	1200µm x 1200µm

The part's die incorporates wire bonding pads with the coordinates of their centers given in Table 3.



Table 3. Die Pad Coordinates

Pin Number	X Coordinate, μm	Y Coordinate, μm	Pin Number	X Coordinate, μm	Y Coordinate, μm
1	300	58	2	450	58
3	600	58	4	750	58
5	900	58	6	1065	135
7	1142	300	8	1142	450
9	1142	600	10	1142	750
11	1142	900	12	1065	1065
13	900	1142	14	750	1142
15	600	1142	16	450	1142
17	300	1142	18	135	1065
19	58	900	20	58	750
21	58	600	22	58	450
23	58	300	24	135	135

The part's identification label is ASNT6124-BD. The first 8 characters of the name before the dash identify the bare die including general circuit family, fabrication technology, specific circuit type, and part version while the 2 characters after the dash indicate that the die is not packaged.

This device complies with the Restriction of Hazardous Substances (RoHS) per 2011/65/EU for all ten substances.

REVISION HISTORY

Revision	Date	Changes
1.4.2	05-2020	Updated Die Information
1.3.2	07-2019	Updated Letterhead
1.3.1	04-2017	Added description of substrate connection Corrected absolute maximum ratings section Corrected electrical characteristics section
1.2.1	06-2016	Corrected voltage levels for agcoff
1.1.1	06-2016	Corrected description of the HS input ports Updated Terminal Functions Added description of the temperature sensor
1.0.1	12-2013	First release