ADSANTEC
Ultra High-Speed Mixed Signal ASICs

Advanced Science And Novel Technology Company, Inc.
2790 Skypark Drive Suite 112, Torrance, CA 90505

Offices: 310-530-9400 / Fax: 310-530-9402
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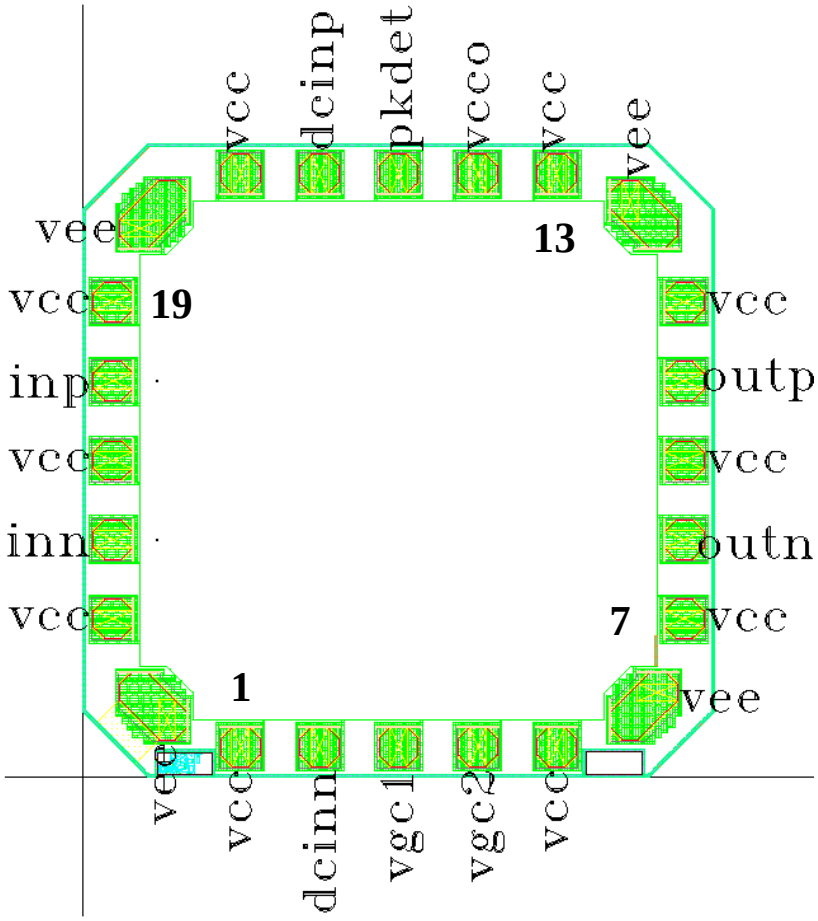
ASNT6141-BD
DC-12G*Hz* Linear amplifier

- Broadband (DC-12*GHz*) linear amplifier for receiver-side applications
- Features controlled gain from 0*dB* to 31.5*dB*
- Features input offset adjustment and input peak detector
- Fully differential input interface with on-chip 50*Ohm* termination
- Fully differential output interface with on-chip 50*Ohm* termination
- Output 1*dB* compression point of 1.5*dBm*
- 3rd Harmonic better than -47*dBc* within the full bandwidth
- 15*dB* Noise Figure
- Single +3.3*V* or -3.3*V* power supply
- Power consumption: 530*mW* typical
- Fabricated in SiGe for high performance, yield, and reliability



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DESCRIPTION

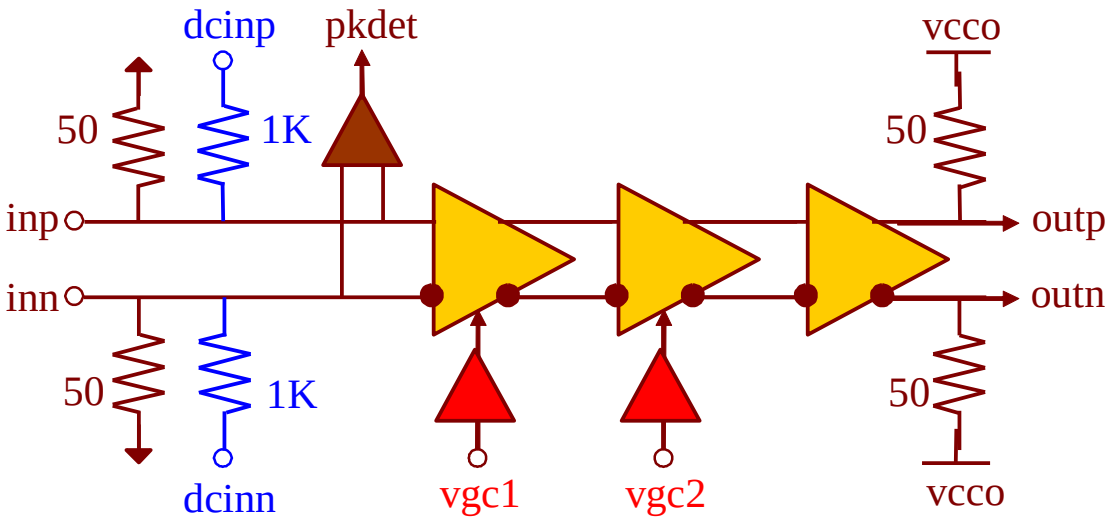

Fig. 1. Functional Block Diagram

The temperature-stable linear amplifier IC shown in Fig. 1 has been fabricated in SiGe technology and provides low-jitter broadband variable signal amplification between its input inp/inn and output outp/outn signal ports. This IC is intended for use in high-speed communication systems. The gain adjustment is performed through two independent external control ports vgc1 and vgc2. The typical gain control characteristic is shown in Fig. 2.

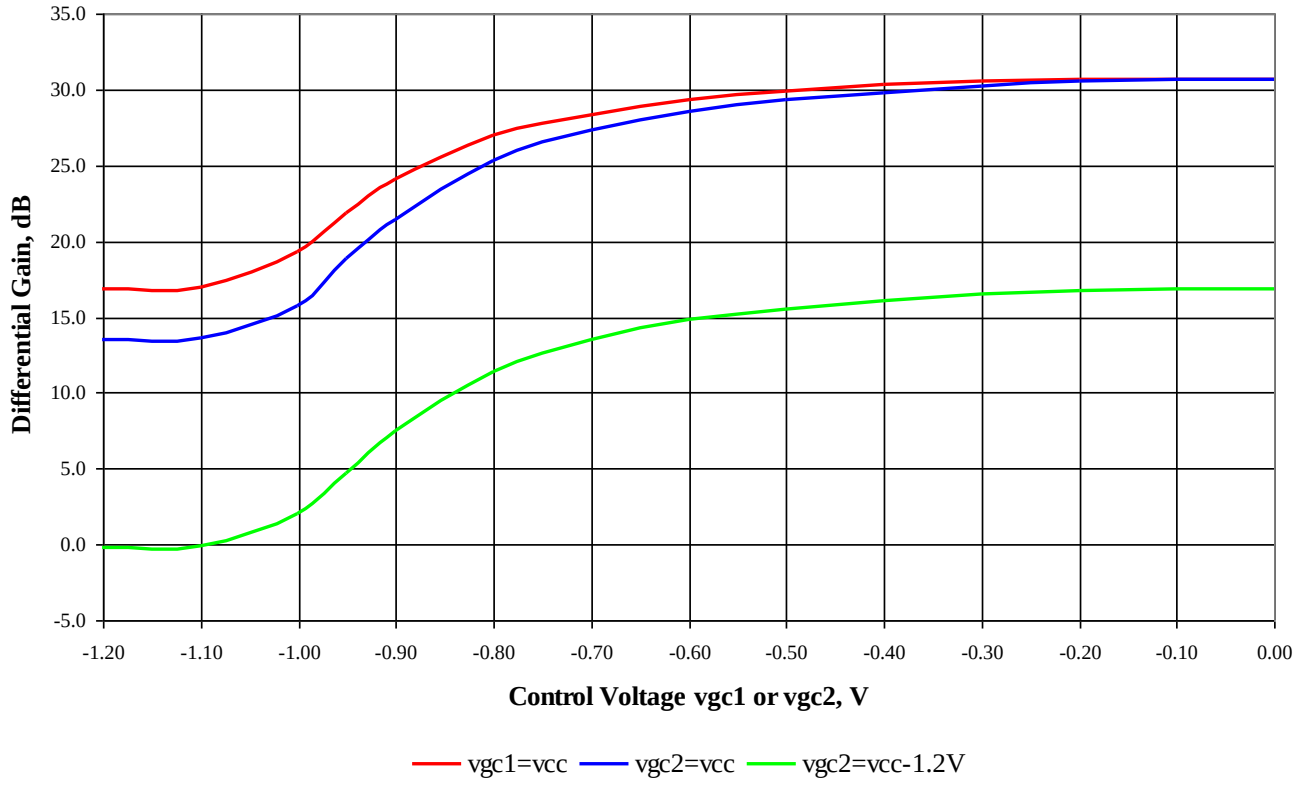

Fig. 2. Typical Gain Control Characteristic

The part's I/Os support the CML logic interface with on chip 50*Ohm* termination to vcc and may be used differentially, AC/DC coupled, single-ended, or in any combination (see also POWER SUPPLY CONFIGURATION). In the DC-coupling mode, the input signal's common mode voltage should comply with the specifications shown in ELECTRICAL CHARACTERISTICS. In the AC-coupling mode, the input termination provides the required common mode voltage automatically. The differential DC signaling mode is recommended for optimal performance.

The on-chip peak detector delivers a single-ended output voltage pkdet reverse-proportional to the input signal's amplitude. A typical dependence of the pkdet output voltage versus single-ended input peak-to-peak swing is shown in Fig. 3.

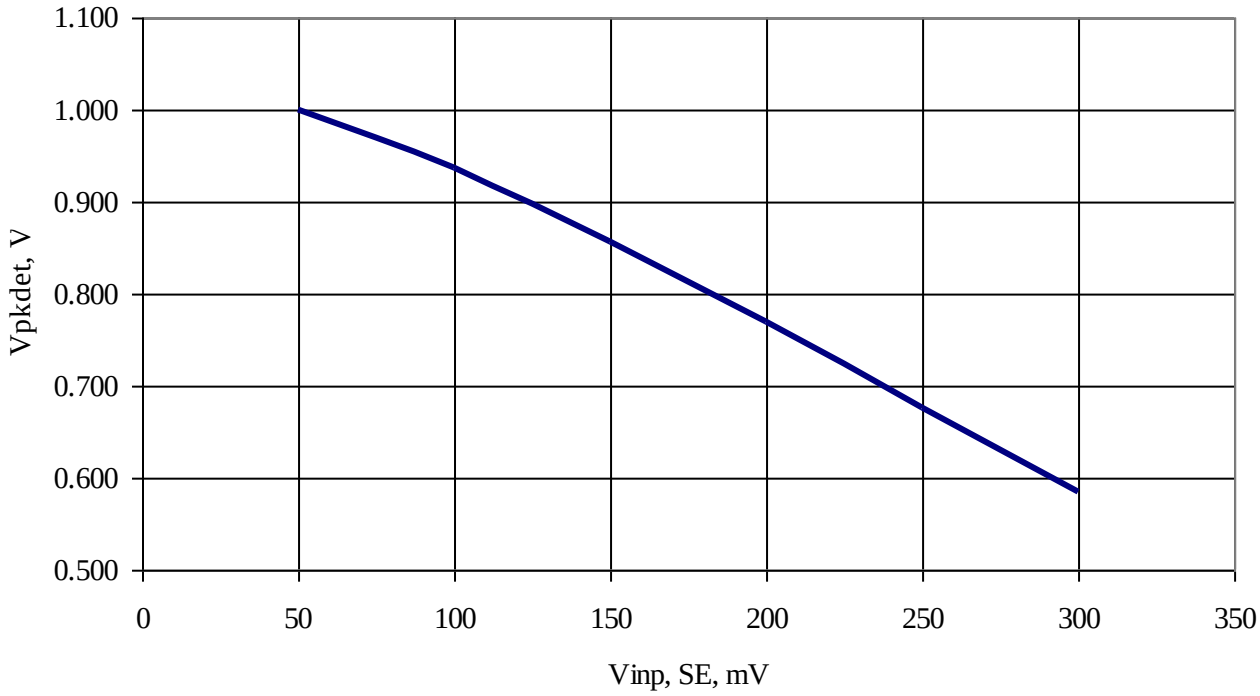

Fig. 3. Typical Peak Detector Output Characteristic

Additional control ports dcinp and dcinn can be used for input signal common-mode voltage adjustment. For the optional output common-mode voltage adjustment, the output termination resistors are connected to a separate positive supply voltage vcco that may be different from vcc.

POWER SUPPLY CONFIGURATION

The part can operate with either a negative supply (vcc = 0.0*V*=ground and vee = -3.3*V*), or a positive supply (vcc = +3.3*V* and vee = 0.0*V*=ground). In case of the positive supply, all I/Os need AC termination when connected to any devices with 50*Ohm* termination to ground. Different PCB layouts will be needed for each different power supply combination.

All the characteristics detailed below assume vcc = 0.0*V* and vee = -3.3*V*.

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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.

Table 1. Absolute Maximum Ratings

Parameter	Min	Max	Units
Main Supply Voltage (vcc-vee)		3.6	*V*
Output Supply Voltage (vcco-vcc)	-0.8	+0.8	*V*
Power Consumption		0.60	*W*
RF Input Voltage Swing (SE)		1.0	*V*
Control Voltages (vgc1-vcc, vgc2-vcc)	-2.0	+0.4	*V*
Case Temperature		+90	*ºC*
Storage Temperature	-40	+100	*ºC*
Operational Humidity	10	98	*%*
Storage Humidity	10	98	*%*

TERMINAL FUNCTIONS

TERMINAL			DESCRIPTION
Name	**No.**	**Type**	
High-Speed I/Os			
inp	20	CML input	Differential high-speed signal inputs with internal SE 50*Ohm* termination to vcc
inn	22		
outp	10	CML output	Differential high-speed signal outputs with internal SE 50*Ohm* termination to vcc. Require external SE 50*Ohm* termination to vcc
outn	8		
Low-Speed I/Os			
dcinp	16	Input	inp DC common mode voltage down shift
dcinn	2	Input	inn common mode control voltage down shift
vgc1	3	Input	Low-speed amplitude adjustment tuning input
vgc2	4	Input	Low-speed amplitude adjustment tuning input
pkdet	15	Output	Peak detector output with on-chip 2.8*KOhm* termination to vcc

Supply and Termination Voltages		
Name	**Description**	**Pin Number**
vcc	Positive power supply (+3.3*V* or 0*V*)	1, 5, 7, 9, 11, 13, 17, 19, 21, 23
vcco	Output buffer power supply	14
vee	Negative power supply (0*V* or -3.3*V*)	6, 12, 18, 24

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ELECTRICAL CHARACTERISTICS

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS	
General Parameters						
vee	-3.1	-3.3	-3.5	*V*	±6%	
vcc		0.0		*V*	External ground	
*I*vee		160	176	*mA*		
Power consumption		530		*mW*		
Junction temperature	-25	50	85	*°C*		
HS Input Data (inp/inn)						
Bandwidth		12		*GHz*	At -3*dB* level from 24*dB* gain	
CM level	-0.8		0	*V*		
Input referred noise density		2.5		*nV/*sqrt*(Hz)*	At maximum gain	
S11		-15		*dB*	DC to 10*GHz*	
HS Output Data (outp/outn)						
CM level		-0.6		*V*		
S22		-15		*dB*	DC to 10*GHz*	
Small-signal differential gain	30	31.5	33	*dB*	At 2*GHz*, vgc1=vgc2=0*V*	
	-0.2	0	0.2	*dB*	At 2*GHz*, vgc1=vgc2=-1.2*V*	
Output referred 1dB compression point		1.5		*dBm*	Single-Ended, at 10*GHz*	
2nd harmonic		-45		*dBc*	<9*GHz*	At 320*mV*p-p output swing, SE
		-40		*dBc*	>9*GHz*	
3rd harmonic		-50		*dBc*	<9*GHz*	
		-47		*dBc*	>9*GHz*	
Low-Speed Control Input (vgc1, vgc2)						
Voltage range	vcc-1.2		vcc	*V*		
Input impedance		2		*KOhm*	Terminated to vcc	
Low-Speed Control Input (dcinp, dcinn)						
Voltage range	vcc-2.0		vcc	*V*		
Input impedance		1		*KOhm*	Terminated to corresponding data inputs	

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DIE INFORMATION

The die has external dimensions of 1.2x1.2mm^2 with an approximate thickness of 280μm, and includes 24 octagonal pads: 5 on each side and 4 corner pads. The pad frame parameters are presented in Table 2.

Table 2. Pad Frame Parameters

Pad Type	Metal dimensions, μm	Opening dimensions, μm	Step, μm
Side pad	80x80	74x74	150
Corner pad	155x80	149x74	n/a

The part's identification name is ASNT6141-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 mark the part as a bare die.

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

REVISION HISTORY

Revision	Date	Changes
1.1.2	05-2020	Updated Die Information
1.0.2	07-2019	Updated Letterhead
1.0.1	10-2018	First release