ADSANTEC
Ultra High-Speed Mixed Signal ASICs

Advanced Science And Novel Technology Company, Inc.
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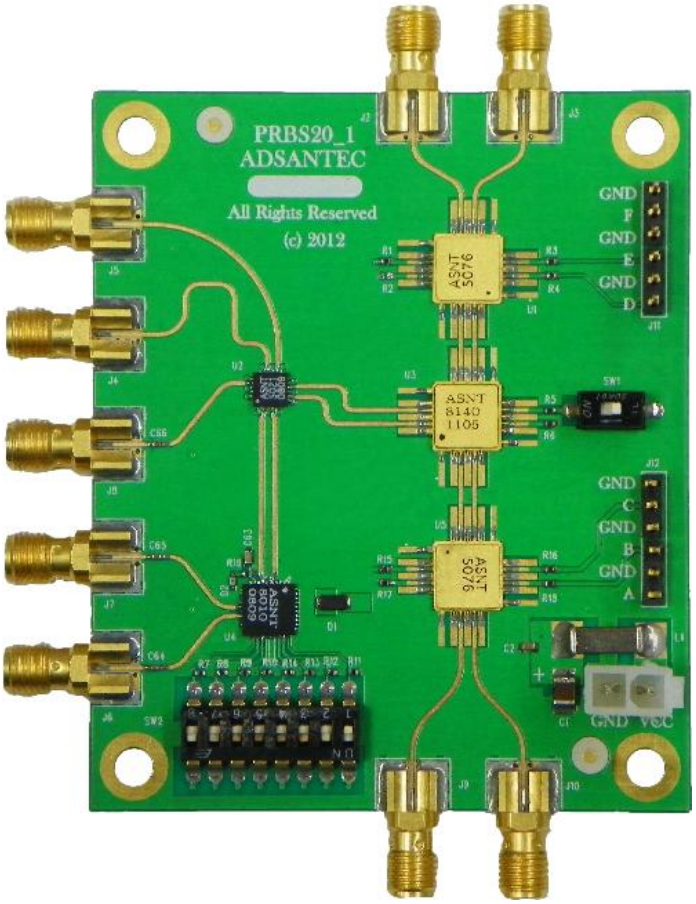
ASNT_PRBS20_1
18*Gbps* 2^7-1 PRBS Generator Featuring Jitter Insertion, Selectable Sync, and Output Amplitude Control

- Broadband frequency range from 20*Mbps* – 18.0*Gbps*
- Minimal insertion jitter
- Fast rise and fall times
- Two PRBS data outputs, jitter insertion capability, and output amplitude control from 0*V* to 1*V* peak to peak.
- Up to 155*ps* delay variation on each output
- Buffered differential clock output
- 50% duty cycle for sync output on all divide ratios
- Sync output and Clock input are AC coupled on board
- Single positive 3.3*V* supply



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DESCRIPTION

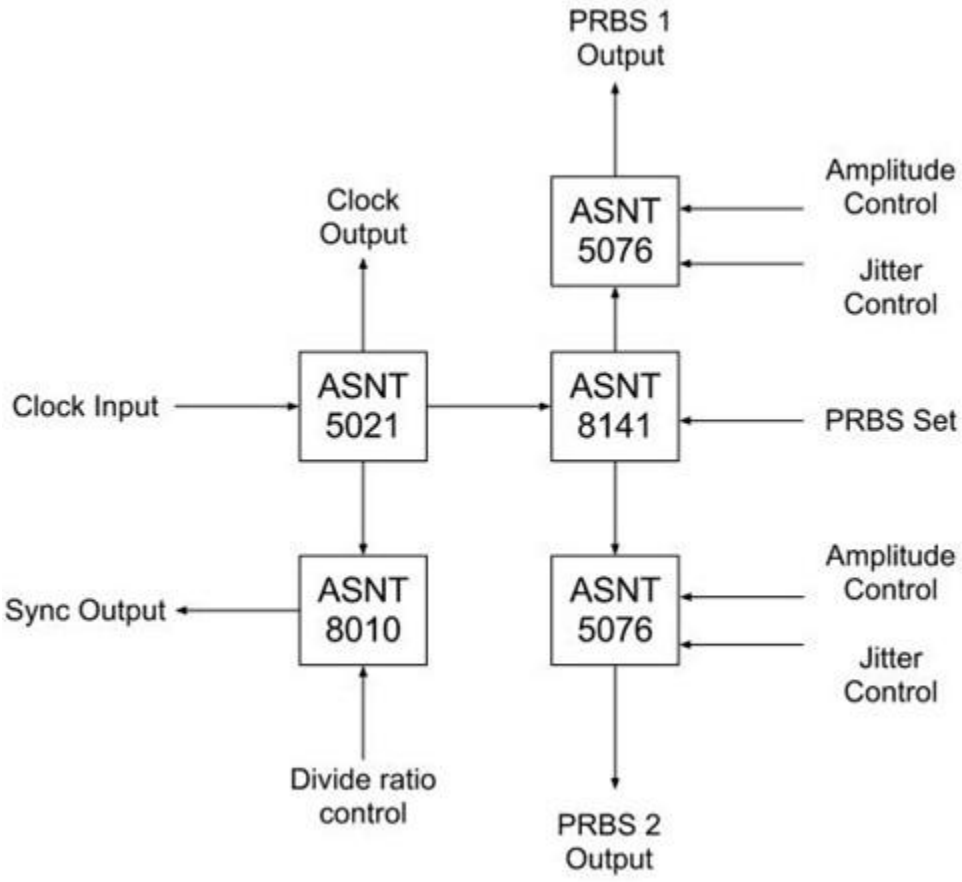

Fig. 1. Functional Block Diagram

The ASNT_PRBS20_1 is a broadband 2^7-1 PRBS generator intended for test, prototyping, microwave, and communication applications. The amplitude and phase can be adjusted on both differential outputs. Jitter can be inserted onto either differential output with a bandwidth up to 500*kHz*. Output amplitude on both PRBS outputs can vary from 0*V* to 1*V* single-ended peak to peak. A single-ended clock from 10*MHz* to 18*GHz* with an amplitude as low as 50*mV* peak to peak may be applied to the clock input. A buffered differential clock output is also provided. A differential Sync Output divides an input clock from 1 to 256. The Sync Output is capable of displaying an eye diagram at divide-by-16 and a PRBS waveform output for 127 or 254. An on board PRBS reset switch can be used to preset the generator to avoid the all zero state lock-up.

The ASNT_PRBS20_1 board contains nine Emerson SMA connectors MFG PN: 142-0761-881, 50*Ohm* transmission lines to the device, and power supply decoupling networks on the evaluation board. Power is supplied through a two-pin MOLEX connector P/N: 39-28-1023.

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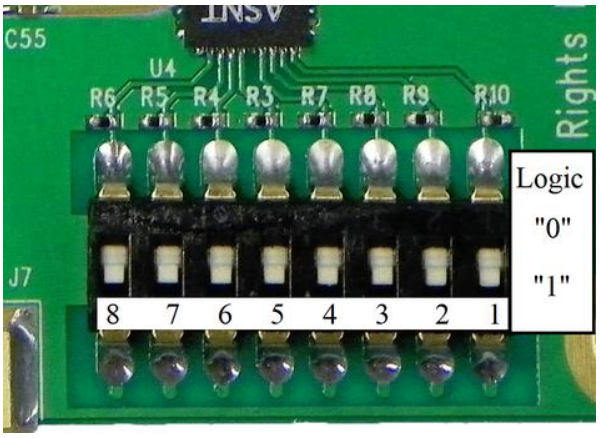
SYNC OUTPUT

The Sync Output can be configured to output any divide ratio from 1 to 256 from the clock input. It contains eight switches that represent 8 bits. The LSB starts at SW1 and the MSB ends at SW8. The binary value of zero gives a decimal n value of 256. Increasing binary values increases the decimal value n.



DIP SW #	n Divide Ratio	
8 7 6 5 4 3 2 1		
0 0 0 0 0 0 0 1	1	
0 0 0 0 0 0 1 0	2	
0 0 0 0 0 0 1 1	3	
0 0 0 1 0 0 0 0	16	Eye diagram
. .		
0 1 1 1 1 1 1 1	127	pattern
1 1 1 1 1 1 1 0	254	pattern
0 0 0 0 0 0 0 0	256	

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.

Table 1. Absolute Maximum Ratings

Parameter	Min	Max	Units
Supply Voltage (vee)		+3.6	*V*
Power Consumption		3.6	*W*
RF Input Voltage Swing (SE)		1.0	*V*
Case Temperature		+90	*°C*
Storage Temperature	-40	+100	*°C*
Operational Humidity	10	98	*%*
Storage Humidity	10	98	*%*

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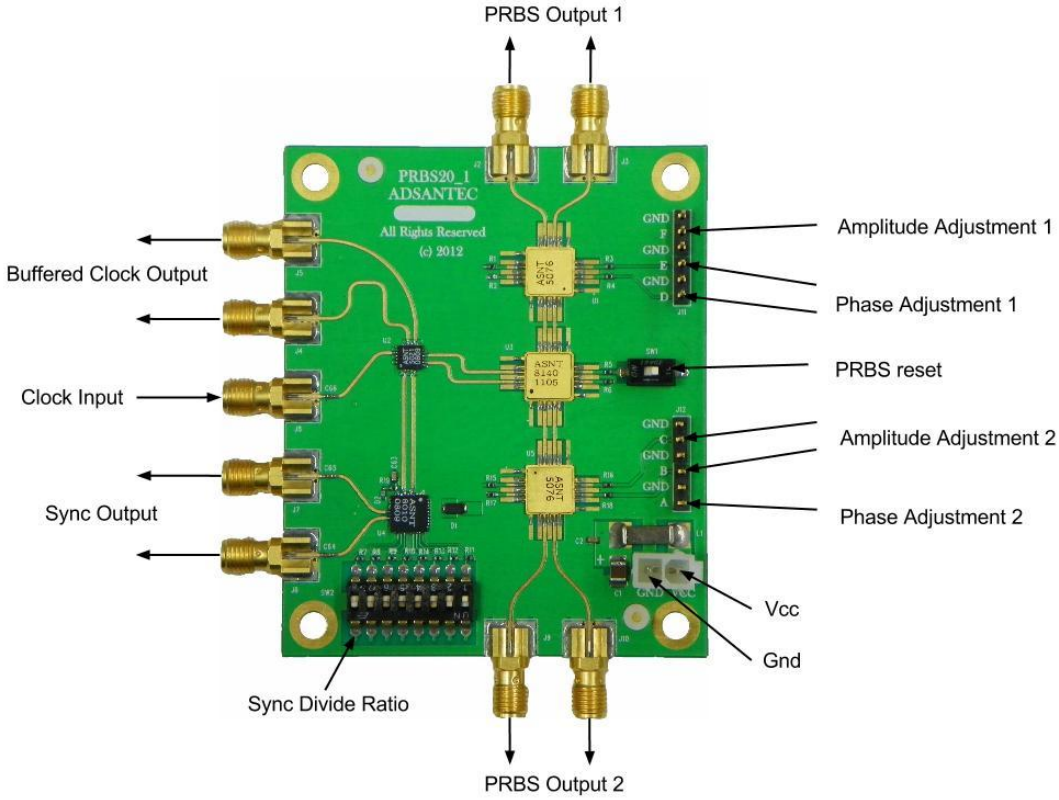
TERMINAL FUNCTIONS



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OPERATION

1. Measure 50*Ohms* on all nine SMA connectors referenced to vcc.

   (NOTE: On board AC coupling prevents direct measurements on all connectors. These values must be measured at the trace referenced to vcc.)

2. Measure 390*Ohms* on headers D and E referenced to vcc. Measure 2.2*kOhms* on headers B and C referenced to vcc. Measure 150*Ohms* on header A and 2*kOhms* on header F referenced to vcc.

   (A deviance of up to 10% in these values is within specification.)

3. Connect the board to a power supply set to 0*V* with a current limit of 2.0*A*.

4. Slowly increase the power supply to + 3.3*V*. Nominal current is 1.9*A*.

5. Apply a DC coupled clock to the Clock Input up to 18*GHz* with peak-to-peak amplitude from 50*mV* to 1*V*. **Note: Clock input is AC coupled on-board.**

6. Connect the PRBS outputs AC coupled to a 50*Ohms* terminated oscilloscope. Place 50*Ohms* AC coupled terminations on all unused input/outputs.

7. Turn PRBS reset to the ON position and then back to the OFF position to reset the PRBS generator.

8. To add jitter or change phase on the PRBS 1 output, apply a 2.1*V* to 3.3*V* to header pin E and float (do not connect) pin D to decrease phase shift. Apply 2.1*V* to 3.3*V* to header pin D and float (do not connect) header pin E to increase phase shift.

9. To change the amplitude on the PRBS 1 output, apply a positive voltage ranging from 2.5V to 3.3V to header pin F. The amplitude control for the PRBS 1 output is single-ended only.

10. To change the amplitude on the PRBS 2 output, apply a voltage ranging from 2.5*V* to 3.3*V* to header pin B and float (do not connect) pin C to increase amplitude. Apply a voltage ranging from 2.5*V* to 3.3*V* to header pin C and float (do not connect) header pin B to decrease amplitude.

11. To add jitter or change phase on the PRBS 2 output, apply a positive voltage ranging from 2.1V to 3.3V to header pin A. The delay control for the PRBS 2 output is single-ended only.

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ELECTRICAL CHARACTERISTICS

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
vee		0		*V*	External ground
vcc	3.1	3.3	3.5	*V*	
I_{VCC}	1.6	1.9	2.4	*A*	
Power		6.3		*W*	
Operating Temperature	-25	50	85	*°C*	
Clock Input					
Frequency	0.02		18	*GHz*	
Single-Ended Swing	50	400	1000	mV_{PP}	
Clock Output					
Frequency	0.02		18	*GHz*	
Single-Ended Swing	570	600	630	mV_{PP}	
Common Mode Level	vcc -0.35	vcc -0.3	vcc -0.25		
Additive Jitter			5	*ps*	Peak-to-Peak
Duty Cycle	45	50	55	%	For Clock Signal
Sync Output					
Frequency	0.01		18	*GHz*	
Single-Ended Swing	570	600	630	mV_{PP}	
Rise/Fall Times	15	17	19	*ps*	20%-80%
Duty Cycle	45%	50%	55%		For clock signal
PRBS_1 Output					
Single-Ended Voltage Level	475	500	525	mV_{PP}	
Common Mode Level	vcc -0.3	vcc -0.25	vcc -0.2	*V*	When Tn is NC
Duty Cycle	45	50	55	%	

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ELECTRICAL CHARACTERISTICS (CONTINUED)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
PRBS_2 Output					
Single-Ended Voltage Level	475	500	525	mV_{PP}	
Common Mode Level	vcc -0.3	vcc -0.25	vcc -0.2	*V*	When Tn is NC
Duty Cycle	45%	50%	55%		
Amplitude Control					
Differential Swing	-2.85		2.85	mV_{PP}	
Common Mode Level	vcc -0.5	vcc -0.25	vcc	*V*	
Amplitude Variation	0	500	1000	*V*	
Bandwidth	0.0		100	*kHz*	
Jitter Control					
Differential Swing	-3.8		3.8	mV_{PP}	
Common Mode Level	vcc -0.5	vcc -0.25	vcc	*V*	
Phase Shift Control	0		155	*ps*	
Shift Stability	-12		12	*ps*	0-125°C
Bandwidth	0.0		500	*kHz*	

REVISION HISTORY

Revision	Date	Changes
1.9.2	08-2020	Updated Ohmic Values
1.8.2	02-2020	Corrected Header Control Voltage Values Corrected Electrical Characteristics
1.7.2	07-2019	Updated Letterhead
1.7.1	04-2019	Added P/N to connector and board description
1.6.1	06-2017	Revised Electrical Characteristics
1.5.1	04-2015	Updated Delay Information
1.4.1	03-2015	Updated Block Diagram
1.3.1	04-2014	Added absolute maximum ratings Updated format
1.2.1	02-2013	Corrected low end frequency input
1.1.1	07-2012	Updated format
1.0	06-2012	Initial Release