BSTTD02-06181

6 - 18GHz 1-bit Real-time Delay Module

Data Sheet

I. Product Introduction

BSTTD02-06181 is a high-performance GaAs 1-bit real-time delay module operating at 6 GHz to 18 GHz.

The use of real-time delay devices instead of phase shifters provides an enhanced broadband bandwidth (less beam reflection effects). BSTTD02-06181 has a single range of 330ps. It achieves very low delay error and insertion loss variation by using an optimized conversion circuit. The chip is manufactured using the PHEMT process.

II. Application Areas

- Communication
- Radar
- Instruments

III. Key Technical Indicators

• Operating frequency:	6 - 18 GHz
• Insertion loss	< 6 dB
• IL flatness	+/- 1dB
• Delay range	330 ps
• Delay step	330 ps
• Input P1dB	> +9.5 dBm
• S11	< -15 dB
• S22	< -12 dB
• 0/4V logic control	
• Chip size	5000 x 2000 μm

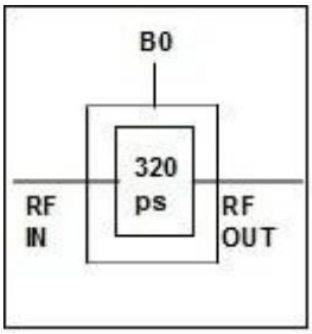

Figure 1. Functional block diagram

IV. Absolute Maximum Ratings

T_{amb} = 25 °C unless otherwise stated

Table 1.

SYMBOL	PARAMETER	CONDITION	MINIMUM	MAXIMUM	UNIT
B0	Real-time delay control input		-0.1	+4.5	V
VSS	Negative power supply voltage		-6	0	V
VDD	Positive supply voltage		0	+6	V
PIN	Input power	PRF @RFIN		+23	dBm
Tj	Junction temperature			+150	° C
Tstg	Storage temperature		-55	+150	° C

V. Working conditions

T_{amb} = 25 °C unless otherwise stated

Table 2.

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	UNIT
B0	Real-time delay control input	0	+4	V
VSS	Negative power supply voltage	-5	0	V
VDD	Positive supply voltage	0	+5	V
Tamb	Ambient temperature	-40	+85	°C

VI. Electrical Parameters

T_{amb} = 25 °C – RF performance, on-wafer test

Table 3.

SYMBOL	PARAMETER	CONDITION	MINIMUM	TYPICAL VALUES	MAXIMUM	UNIT
BW	Bandwidth		6		18	GHz
RF performance at 12 GHz unless otherwise noted						
IL	Insertion loss			3	6	dB
TDr	Real-time delay range		325	330	340	ps
TDstep	Real-time delay stepping		325	330	340	ps
S11	Input reflection coefficient			-18	-15	dB
S22	Output reflection coefficient			-14.5	-12	dB
ILvar	IL changes	Reference state vs 330ps		+/- 1.4	+/- 2	dB
P1dB	Input 1dB compression point			9.5		dBm

6.1. Logic Truth Table

Table 4.

	B0
Nominal real-time latency	330 ps
Pads	B0
Real-time delayed activity	4V
Reference State	0V

6.2. Control voltage

Table 5.

STATE	MINIMUM	TYPICAL VALUES	MAXIMUM	UNIT
Low	-0.1	0	+0.1	V
High	+3.5	+4	+4.5	V

VII. Wafer testing

7.1. S-parameter curves

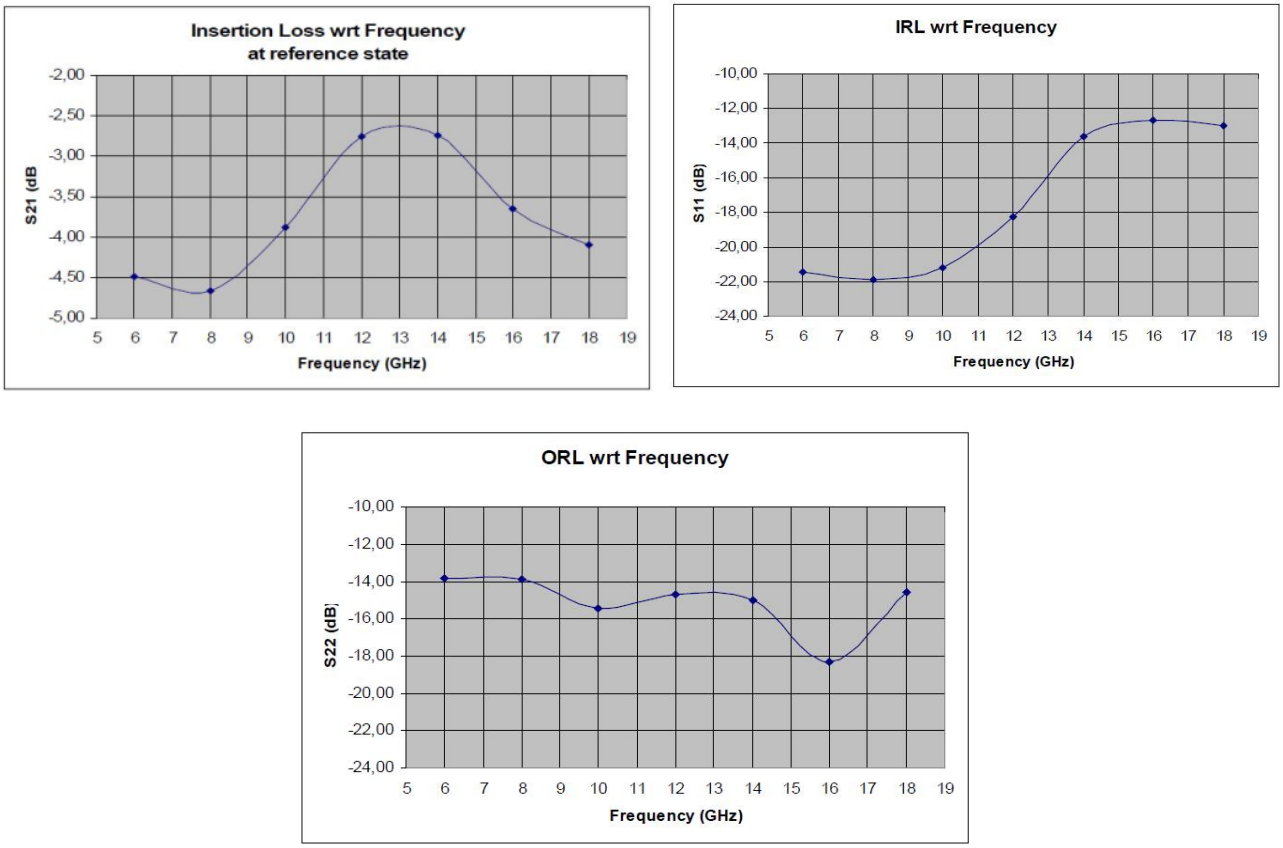

Figure 2. Test wafer @ T = 25 °C

7.2. Real-Time Latency Performance

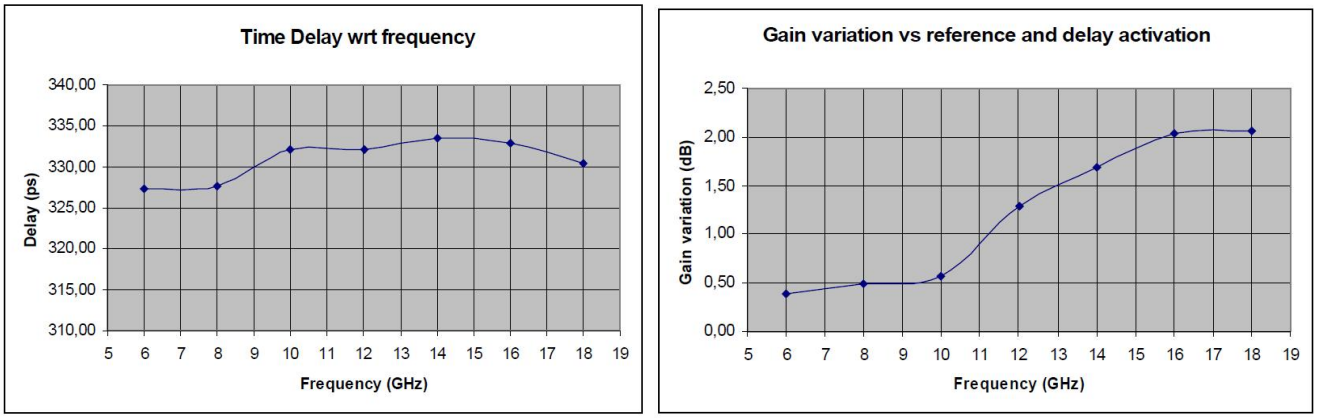

Figure 3. Test wafer @ T = 25 °C

VIII. Size information

Chip size = 5000 x 2000 μm (4965 x 1965 μm ± 5 μm after dicing)

DC pad = 100 x 125 μm, top metal = Au

RF pad = 110 x 150 μm, top metal = Au

Chip thickness 100 μm

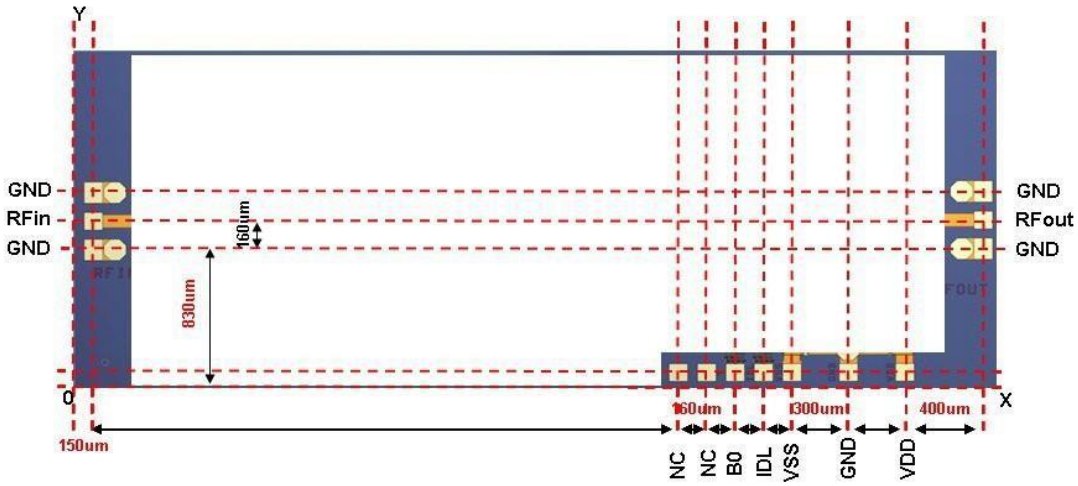

Figure 4.

IX. Pad location

Table 5.

PAD NAME	SYMBOL	COORDINATE		DESCRIBE
		X	Y	
GND	GND	150	830	Grounding
RF_{in}	RF_{in}	150	990	RF input
GND	GND	150	1150	Grounding
GND	GND	4850	1150	Grounding
R_{out}	RF_{out}	4850	990	RF output
GND	GND	4850	830	Grounding
VDD	VDD	4450	100	Positive supply voltage
GND	GND	4150	100	Grounding
VSS	VSS	2850	100	Negative power supply voltage
IDL	IDL	2690	100	Amplifier Current Control
T	B0	2530	100	Unit real-time control delay input

X=0, Y=0 is in the lower left corner.

X. Bonding and assembly information

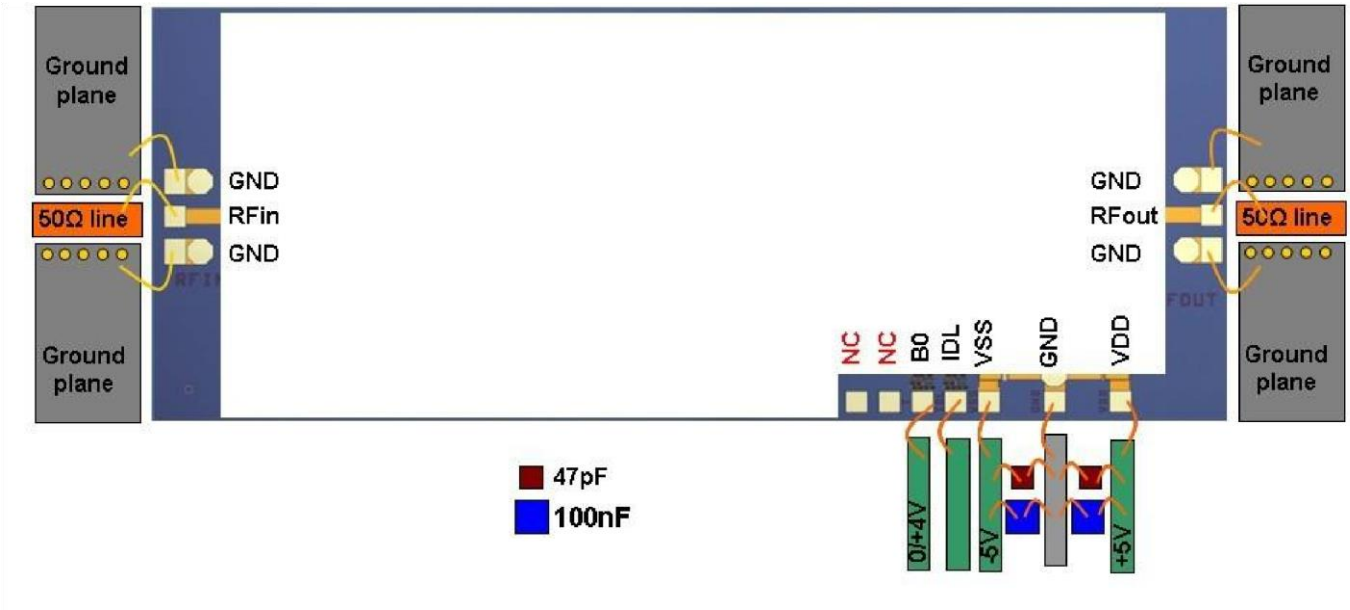

Figure 5.

RF interface wires or ribbons should be kept as short as possible.

RF lines should be 300μm wide or narrower to minimize discontinuities in connection with the MMIC pads.

XI. Decoupling BOM

Table 6.

	VDD	VSS
Chip SMD Capacitor 1	47pF or 100pF	47pF or 100pF
Chip SMD Capacitor 2	100nF	100nF

Note: No decoupling on digital control pads.