BGA7P320

Pre-Driver for Doherty Power Amplifier

Features

- Operation frequency range: 3300 to 4200MHz
- Gain: 34.4dB
- Output P1dB: 27.8dBm
- 100Ω differential input
- 3.3V supply voltage
- TSNP-16 leadless package (3.0 x 3.0 mm^2)
- SiGe Technology

Potential Application

- 5G m-MIMO
- Mobile Infrastructure

Product Validation

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

Block diagram

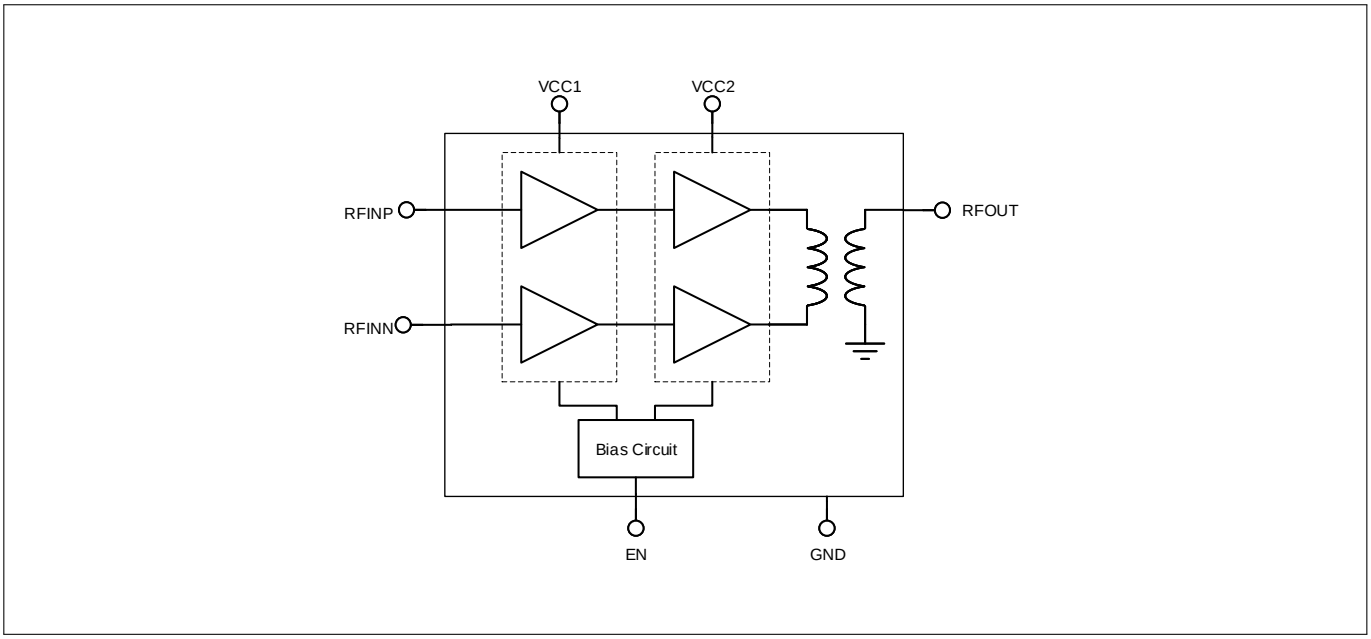

Table of Contents

1 Features

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Description

The product is a stand-alone pre-driver in package. The pre-driver is a two-stage amplifier designed to be used in the 5G Tx line-up for base station applications as the pre-driver for the Doherty power amplifier. It has been designed in the INFINEON SiGe technology. The input is 100Ω differential, the output is 50Ω single-ended.
The device configuration is shown in Fig. 1.

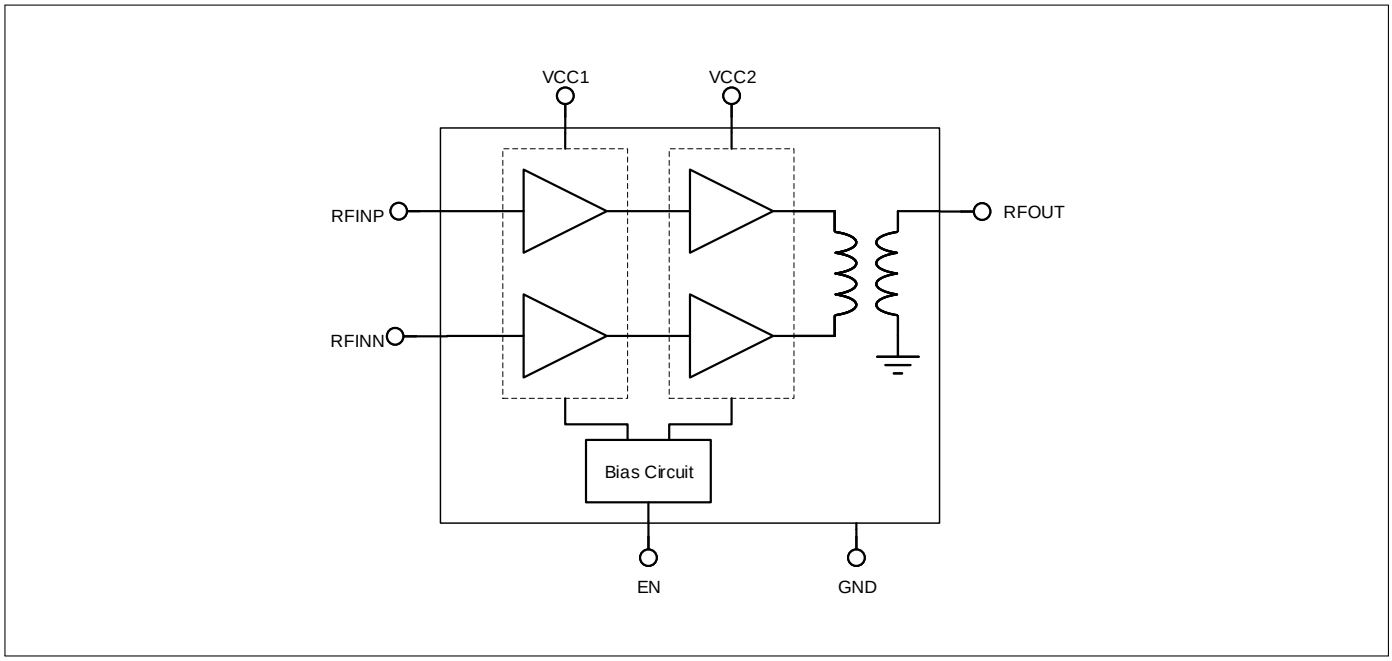

Figure 1: BGA7P320 Block diagram

Product Name	Marking	Package
BGA7P320	B7P320 YYWW(YY=year, WW=week)	PG-TSNP-16-12

2 Maximum Ratings

Table 1: Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{CC}	-0.5	–	3.6	V	[1]
Storage Temperature	T_{STG}	-45	–	150	°C	–
Junction Temperature	T_J	-40	–	170	°C	–
DC voltage on RF Ports	$V_{RF,DC}$	0	–	0	V	[1]
RF Input Power CW	$P_{IN,CW}$	–	–	12	dBm	–
ESD Capability HBM [2]	$V_{ESD,HBM}$	–	–	2	kV	–
ESD Capability CDM [3]	$V_{ESD,CDM}$	–	–	500	V	–

[1] All voltages refer to GND-Nodes unless otherwise noted
[2] Human Body Model ANSI/ESDA/JEDECJS-001 (R = 1.5kΩ, C = 100pF)
[3] Field-Induced Charged-Device Model ANSI/ESDA/JEDECJS-002. Simulates charging/discharging events that occur in production equipment and processes. Potential for CDM ESD events occurs whenever there is metal-to-metal contact in manufacturing.

Warning: Stresses above the max. values listed here may cause permanent damage to the device. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit. Exposure to conditions at or below absolute maximum rating but above the specified maximum operation conditions may affect device reliability and life time. Functionality of the device might not be given under these conditions.

Table 2: Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance - Junction - Solder (@25°C)	$R_{th,JS}$	21.3	°K/W
Thermal Resistance - Junction - Case-Top (@25°C)	$R_{th,JC}$	105.9	°K/W

Table 3: Recommended Operating Conditions

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{CC}	3.15	–	3.45	V	–
Enable Voltage OFF	$V_{EN,OFF}$	0	–	0.75	V	–
Enable Voltage ON	$V_{EN,ON}$	0.95	–	V_{CC}	V	–
Operating Temperature	T_A	-40	–	115	°C	Solder joint temperature

3 Electrical Characteristics

Table 4: Electrical Characteristics

Parameter	Symbol	Values[1]			Unit	Note / Test Condition [2]
		Min.	Typ.	Max.		
RF Frequency	f_{RF}	3300	–	4200	MHz	–
Current Consumption OFF	$I_{CC,OFF}$	–	1.7	–	mA	–
Current Consumption ON	$I_{CC,ON}$	–	152	210	mA	No RF input signal
Input Return Loss	RL_{IN}	–	15	–	dB	–
Output Return Loss	RL_{OUT}	–	15	–	dB	–
Gain	G	30.8	34.4	–	dB	–
Gain Flatness		–	–	0.5	dB	In any 100Mhz BW within RF band
Output P1dB	OP_{1dB}	24.5	27.8	–	dBm	–
Output IP3	OIP_3	–	37	–	dBm	P_{IN1}=P_{IN2}=-30dBm, Δf=1MHz
Adjacent Channel Leakage Ratio	$ACLR$	–	50	–	dBc	20MHz E-TM1.1 @Pout=15dBm
Common Mode Rejection Ratio	$CMRR$	24	–	–	dB	–
Noise Figure	NF	–	3.5	–	dB	–
ON/OFF Time	T_{ON}, T_{OFF}	–	2.5	–	μs	Gain within 0.1dB amplitude/1° phase of final value

[1] Min/Max values defined over process, voltage, temperature and frequency variations
[2] Test conditions (unless otherwise noted): T=25°C, V_{CC}=3.3V, f_{RF}=3.6GHz

4 Performance Variation

Table 5: Gain Variation Contributions

Parameter	Frequency Range			Unit
	3.4GHz-3.6GHz	3.3GHz-3.9GHz	3.3GHz-4.2GHz	
Typical	34.5	34.5	34.4	dB
Process Variation[1]	± 0.75	± 0.9	± 1.35	dB
Temperature Variation[2]	-0.018	-0.018	-0.019	dB/°C
Minimum	31.7	31.6	30.8	dB

[1]Process variation is based on simulation data ($\pm 3\sigma$)
[2]Temperature variation is based on measured data

Table 6: OP1dB Variation Contributions

Parameter	Frequency Range			Unit
	3.4GHz-3.6GHz	3.3GHz-3.9GHz	3.3GHz-4.2GHz	
Typical	27.4	27.8	27.8	dBm
Process Variation[1]	± 1.5	± 1.5	± 1.5	dB
Temperature Variation[2]	-0.008	-0.010	-0.010	dB/°C
Minimum	24.5	24.5	24.5	dBm

[1]Process variation is based on simulation data ($\pm 3\sigma$)
[2]Temperature variation is based on measured data

Table 7: OIP3 Variation Contributions

Parameter	Frequency Range			Unit
	3.4GHz-3.6GHz	3.3GHz-3.9GHz	3.3GHz-4.2GHz	
Typical	35.9	36.4	37	dBm
Process Variation[1]	± TBD	± TBD	± TBD	dB
Temperature Variation[2]	0.025	0.039	0.062	dB/°C
Minimum	TBD	TBD	TBD	dBm

[1]OIP3 simulation provides insufficient resolution. Process variations will be assessed from larger device volume.
[2]Temperature variation is based on measured data

5 Application Information

Pin Configuration and Function

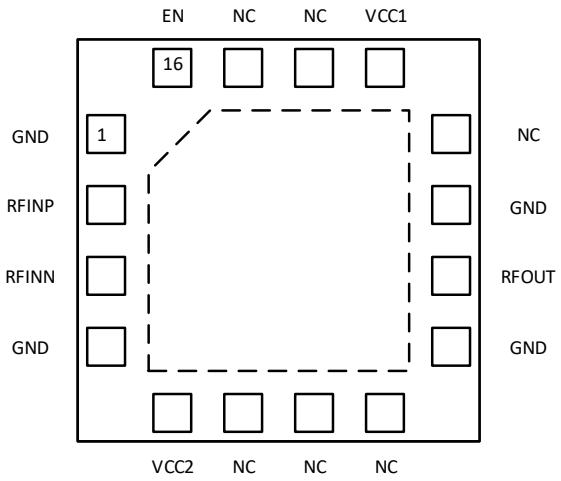

Figure 2: BGA7P320 Pin Configuration - Top View

Table 8: Pin Definition and Function

Pin No.	Name	Function
1, 4, 9, 11	GND	Ground
2	RFINP	RF Input +
3	RFINN	RF Input -
5	VCC2	2^{nd} stage DC voltage supply
6, 7, 8, 12, 14, 15	NC	Not connected internally. It can be either left floating or connected to ground.
10	RFOUT	RF Output
13	VCC1	1^{st} stage DC voltage supply
16	EN	Chip enable
Backside Paddle	GND	Ground connection

Application Board Configuration

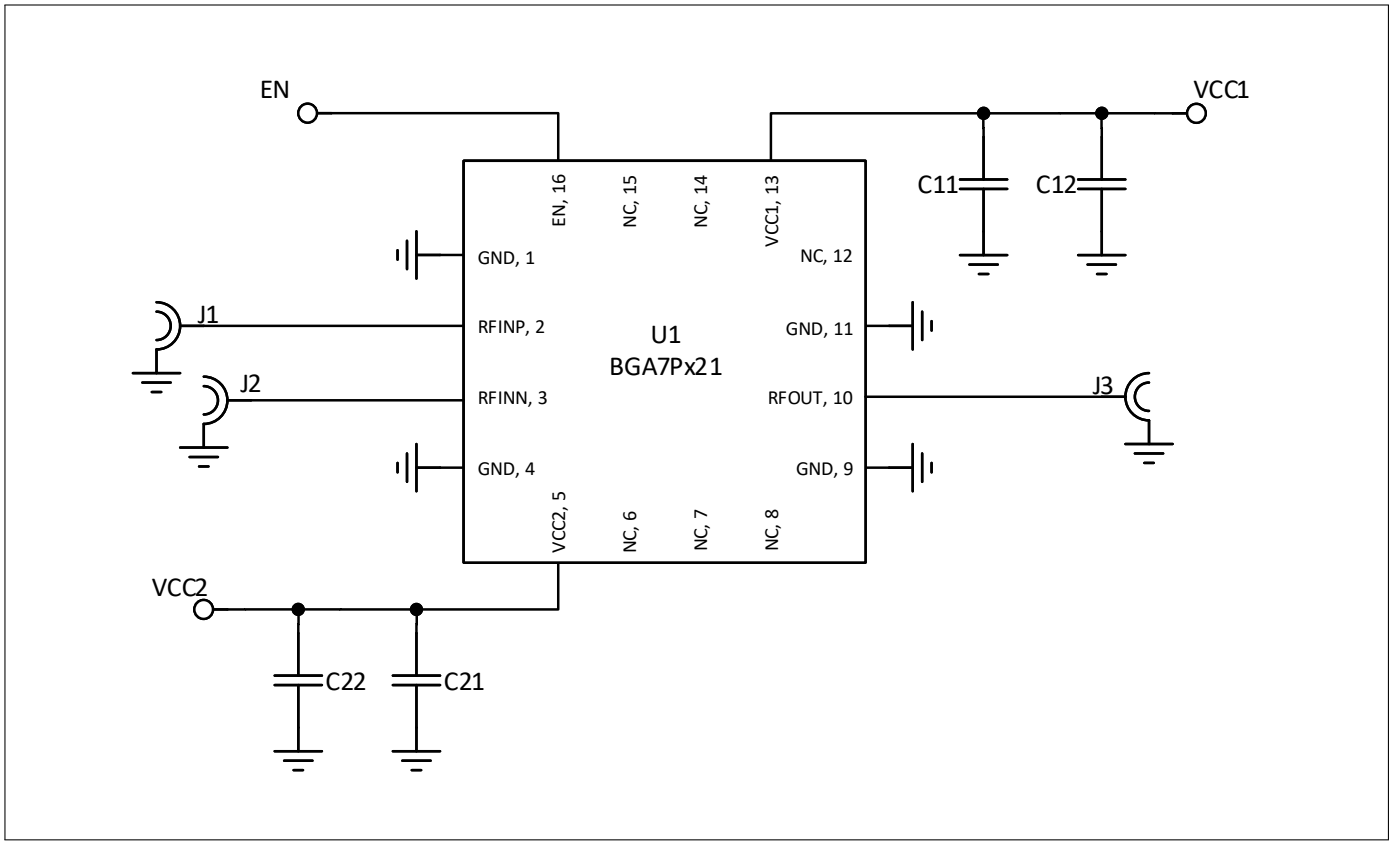

Figure 3: BGA7P320 Application Schematic

Table 9: Bill of Materials Table

Name	Value	Description	Part Number	Manufacturer
C11, C21	10nF	Capacitor, X7R, 0402	–	Various
C12, C22	1uF	Capacitor, X7R, 0402	–	Various
J1, J2, J3	–	Connector, SMA	32K243-40ML5	Rosenberger
U1	–	Pre-driver, PG-TSNP-16-12	BGA7P320	Infineon

6 Package Information

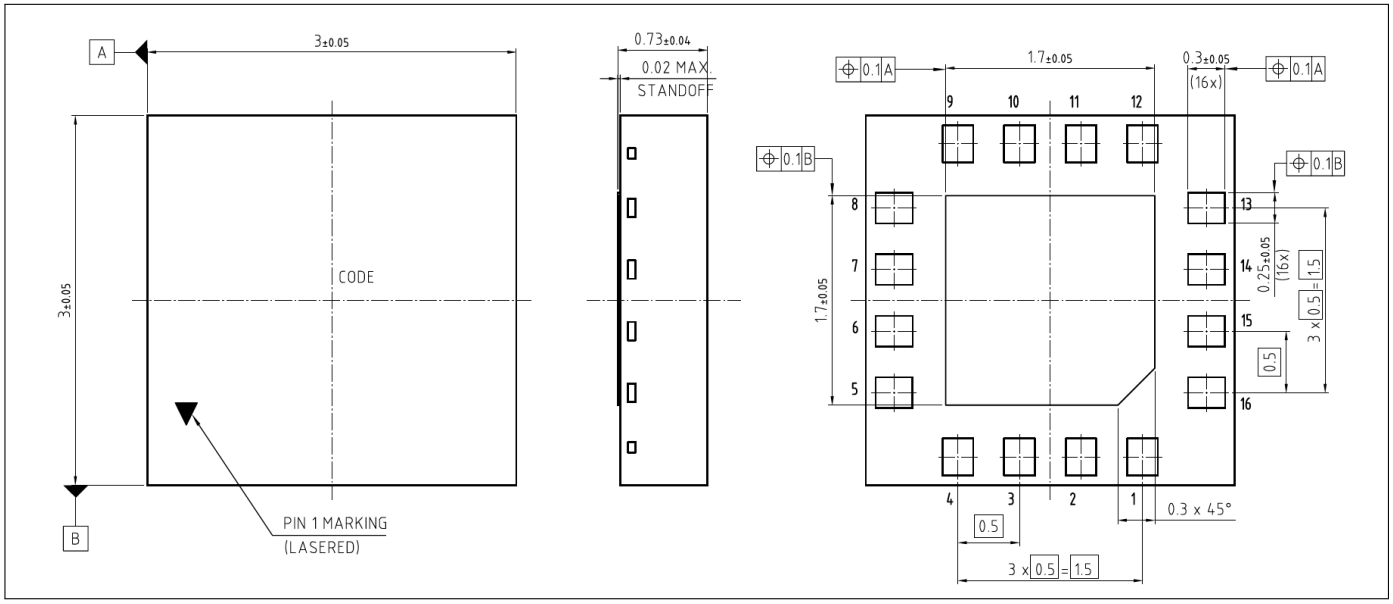

Figure 4: PG-TSNP-16-12 Package Outline (3.0mm x 3.0mm x 0.73mm)

Revision History	
1.0	
Page or Item	**Subjects (major changes since previous revision)**
Revision 1.1, 2021-06-22	
Revision History	
pag. 4	Updated ACLR value and test condition

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