

BGA7P220

Pre-Driver for Doherty Power Amplifier

Features

- Operation frequency range: 2300 to 2700MHz
- Gain: 34.4dB
- Output P1dB: 27.5dBm
- 100Ω differential input
- 3.3V supply voltage
- TSNP-16 leadless package (3.0 x 3.0 mm²)
- 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

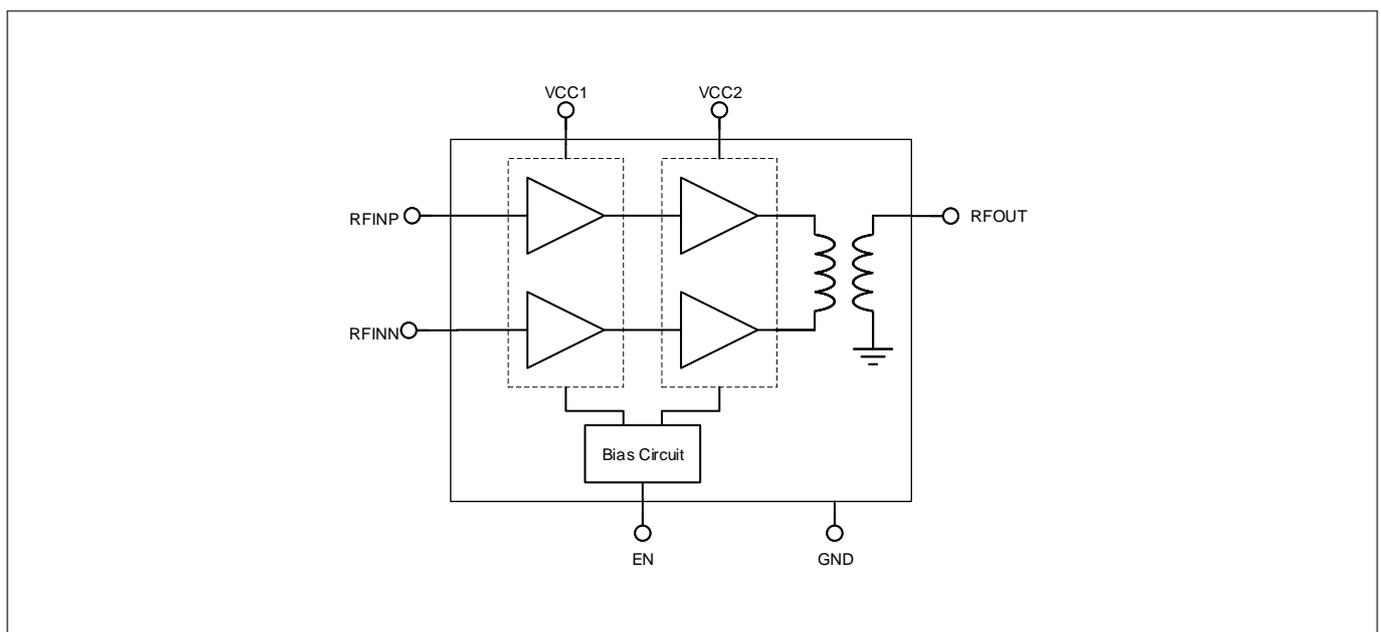


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Features

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.

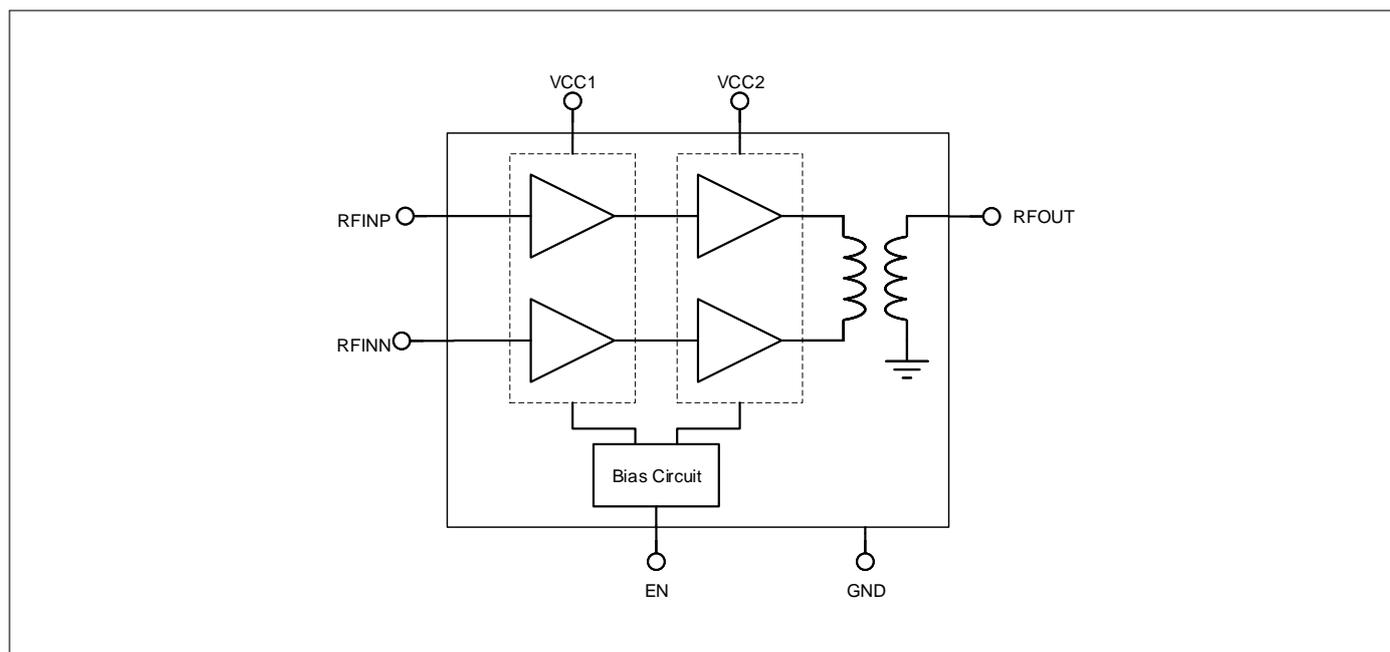


Figure 1: BGA7P220 Block diagram

Product Name	Marking	Package
BGA7P220	B7P220 YYWW(YY=year, WW=week)	PG-TSNP-16-12

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Maximum Ratings

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	–

¹All voltages refer to GND-Nodes unless otherwise noted

²Human Body Model ANSI/ESDA/JEDECJS-001 (R = 1.5kΩ, C = 100pF)

³Field-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

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Electrical Characteristics

3 Electrical Characteristics

Table 4: Electrical Characteristics

Parameter	Symbol	Values ¹			Unit	Note / Test Condition ²
		Min.	Typ.	Max.		
RF Frequency	f_{RF}	2300	–	2700	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	31.5	34.4	–	dB	–
Gain Flatness		–	–	0.5	dB	In any 100Mhz BW within RF band
Output P1dB	OP_{1dB}	24.5	27.5	–	dBm	–
Output IP3	OIP_3	–	32.2	–	dBm	$P_{IN1}=P_{IN2}=-30dBm, \Delta f=1MHz$
Adjacent Channel Leakage Ratio	$ACLR$	–	45	–	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

¹Min/Max values defined over process, voltage, temperature and frequency variations

²Test conditions (unless otherwise noted): T=25°C, V_{CC}=3.3V, f_{RF}=2.5GHz

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Performance Variation

4 Performance Variation

Table 5: Gain Variation Contributions

Parameter	Frequency Range			Unit
	2.3GHz-2.7GHz	-	-	
Typical	34.4	-	-	dB
Process Variation ¹	± 0.8	-	-	dB
Temperature Variation ²	-0.023	-	-	dB/°C
Minimum	31.5	-	-	dB

¹Process variation is based on simulation data ($\pm 3\sigma$)

²Temperature variation is based on measured data

Table 6: OP1dB Variation Contributions

Parameter	Frequency Range			Unit
	2.3GHz-2.7GHz	-	-	
Typical	27.5	-	-	dBm
Process Variation ¹	± 1.5	-	-	dB
Temperature Variation ²	-0.010	-	-	dB/°C
Minimum	24.5	-	-	dBm

¹Process variation is based on simulation data ($\pm 3\sigma$)

²Temperature variation is based on measured data

Table 7: OIP3 Variation Contributions

Parameter	Frequency Range			Unit
	2.3GHz-2.7GHz	-	-	
Typical	32.2	-	-	dBm
Process Variation ¹	± TBD	-	-	dB
Temperature Variation ²	0.019	-	-	dB/°C
Minimum	TBD	-	-	dBm

¹OIP3 simulation provides insufficient resolution. Process variations will be assessed from larger device volume.

²Temperature variation is based on measured data

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Application Information

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Pin Configuration and Function

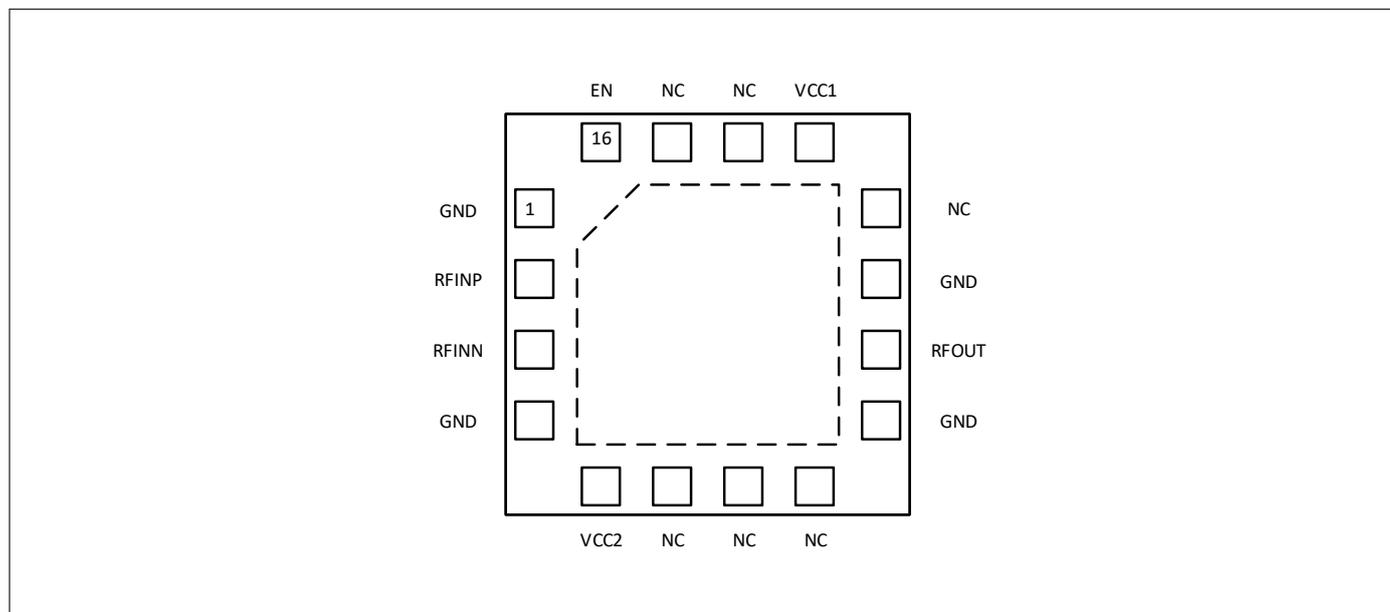


Figure 2: BGA7P220 Pin Configuration - Top View

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

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Application Information

Application Board Configuration

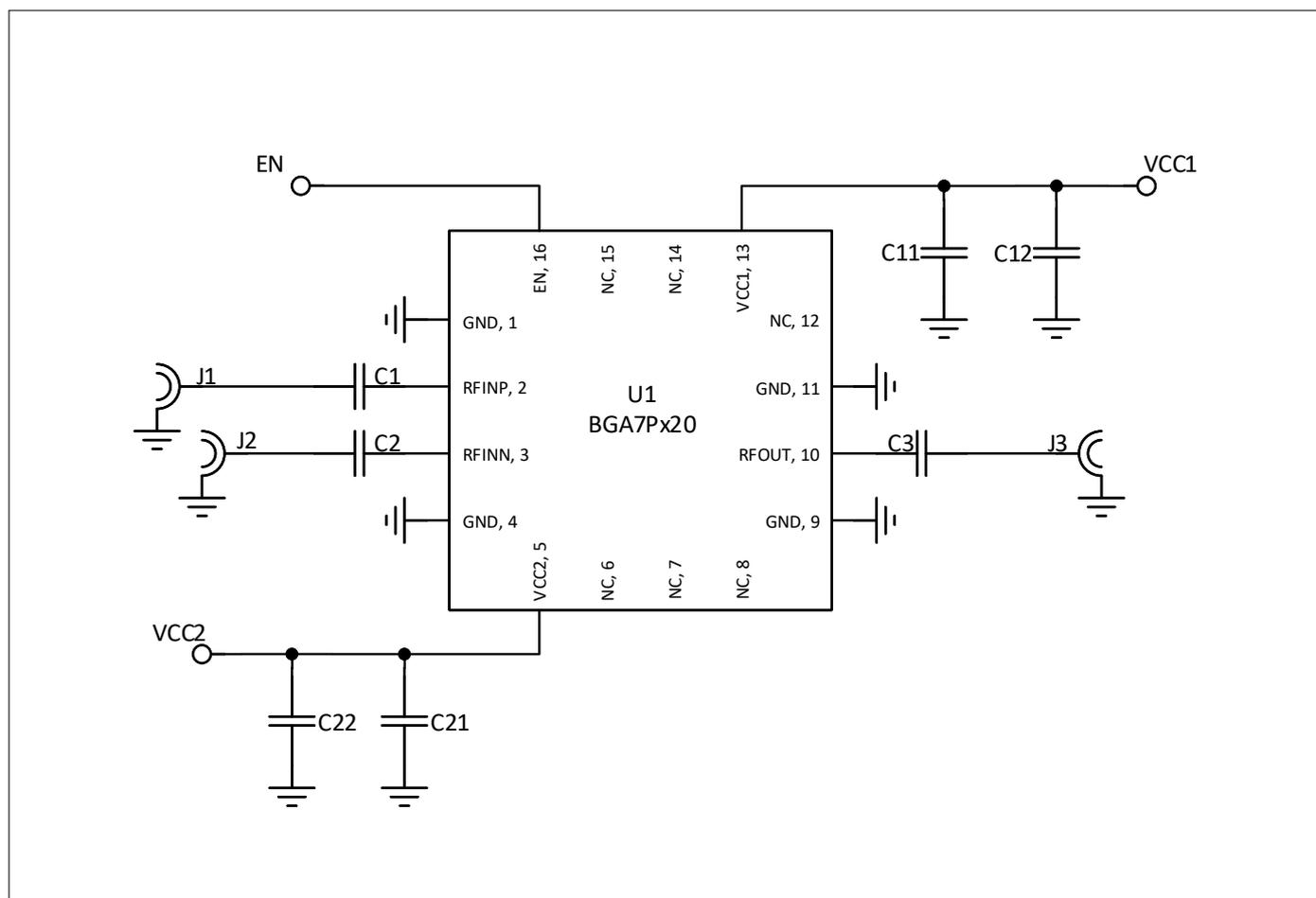


Figure 3: BGA7P220 Application Schematic

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	BGA7P220	Infineon

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Package Information

6 Package Information

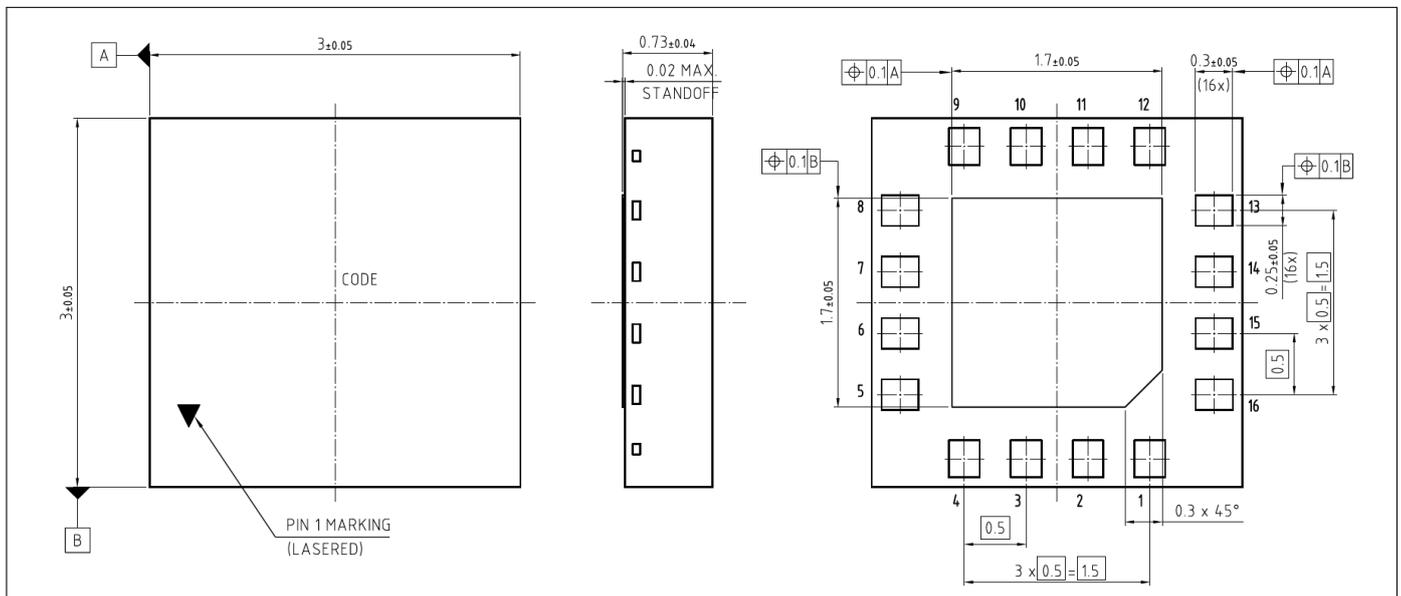


Figure 4: PG-TSNP-16-12 Package Outline (3.0mm x 3.0mm x 0.73mm)

Revision History

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Page or Item	Subjects (major changes since previous revision)
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Revision 1.0, 2021-06-21	
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Revision History

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