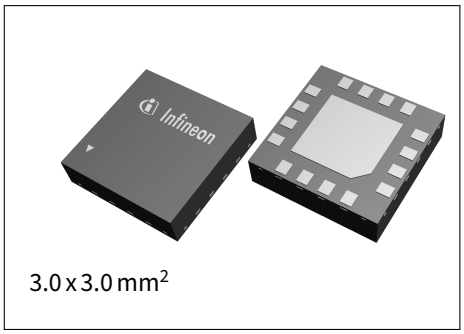
BGAP2D20A

Pre-Driver for Wireless Infrastructure Applications

1 Features

- Operation frequency range: 2300 to 2700MHz
- Gain: 35.1dB
- Output P1dB: 28.9dBm
- 100Ω differential input
- 5V supply voltage
- TSNP-16 leadless package (3.0 x 3.0 mm^2)
- BiCMOS Technology



3.0 x 3.0 mm^2

2 Potential Applications

- 4G/5G
- Cellular Infrastructure
  - Massive MIMO systems
  - Small cells

3 Product Validation

RoHS Halogen-Free Lead-Free Green

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

4 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 BiCMOS technology. The input is 100Ω differential, the output is 50Ω single-ended.
The device configuration is shown in Fig. 1.

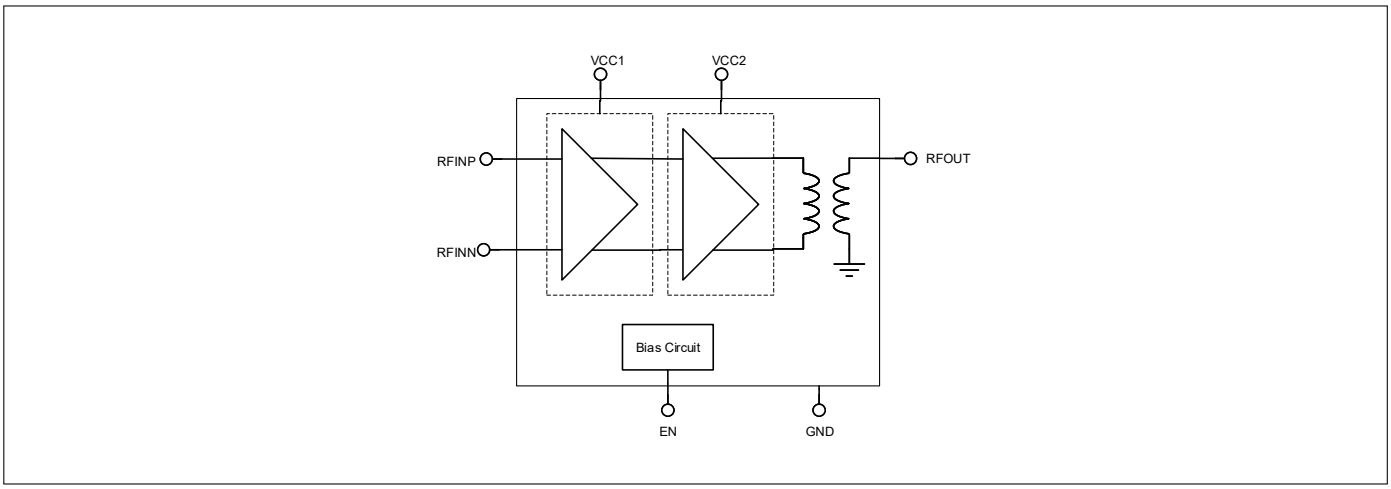


Figure 1: BGAP2D20A Block diagram

Product Name	Marking	Package
BGAP2D20A	BP2D2A YYWW(YY=year, WW=week)	PG-TSNP-16-12

Table of Contents

5 Absolute Maximum Ratings

Table 1: Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{CC}	-0.5	–	5.5	V	[1]
Enable Voltage	V_{EN}	-0.4	–	4	V	–
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	$P_{IN,CW}$	–	–	6	dBm	–
ESD Capability HBM [2]	$V_{ESD,HBM}$	–	–	1	kV	–
ESD Capability CDM [3]	$V_{ESD,CDM}$	–	–	250	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 pad (@25°C)	$R_{th,JS}$	19.6	°K/W

Table 3: Recommended Operating Conditions

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{CC}	4.75	–	5.25	V	–
Enable Voltage OFF	$V_{EN,OFF}$	0	–	0.63	V	–
Enable Voltage ON	$V_{EN,ON}$	1.17	–	3.6	V	–
Operating Temperature	T_A	-40	–	115	°C	Solder joint temperature

Power-up and power-down sequences
The following sequences are required to be respected during power-up/down of the device.
Power-up sequence: 1. VCC1 and VCC2 -> on; 2. EN -> on.
Power-down sequence: 1. EN -> off; 2. VCC1 and VCC2 -> off.
Deviating from these sequences may cause permanent damage.

6 Electrical Characteristics

Table 4: Electrical Characteristics

Parameter	Symbol	Values[1]			Unit	Note / Test Condition
		Min.	Typ.	Max.		
RF Frequency	f_{RF}	2300	–	2700	MHz	–
Current Consumption OFF	$I_{CC,OFF}$	–	1.2	–	mA	–
Current Consumption ON	$I_{CC,ON}$	–	121	156[2]	mA	No RF input signal
Input Return Loss	RL_{IN}	–	19	–	dB	–
Output Return Loss	RL_{OUT}	–	16	–	dB	–
Gain	G	33[2]	35.1	–	dB	–
Gain Flatness	G_{FLAT}	–	–	0.16	dB	Defined in any 100MHz within band
Output P1dB	OP_{1dB}	27.1	28.9	–	dBm	–
Output IP3	OIP_3	–	34.3	–	dBm	P_{IN1}=P_{IN2}=-25dBm, Δf=1MHz
Adjacent Channel Leakage Ratio	$ACLR$	–	-47.8	-44.2	dBc	20MHz E-TM1.1 with 10.2 dB PAPR @Pout=15 dBm
Common Mode Rejection Ratio	$CMRR$	30	–	–	dB	–
Noise Figure	NF	–	3.4	4.7	dB	–
Switching ON Time	T_{ON}	–	0.8	–	μs	Gain within 0.1dB amplitude/1° phase of final value
Switching OFF Time	T_{OFF}	–	–	0.3	μs	Gain within <5% and power dissipation <10% than in ON state

[1]Typical values: T=25°C, V_{CC}=5V, f_{RF}=2.5GHz. Min/Max values defined over process, voltage, temperature and frequency variations based on characterization.
[2]Verified in production test

7 Application Information

Pin Configuration and Function

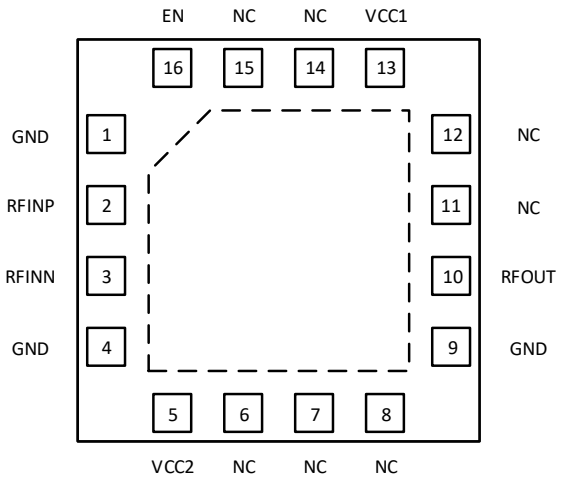


Figure 2: BGAP2D20A Pin Configuration - Top View

Table 5: Pin Definition and Function

Pin No.	Name	Function
1, 4, 9	GND	Ground
2	RFINP	RF Input +
3	RFINN	RF Input -
5	VCC2	2^{nd} stage DC voltage supply
6, 7, 8, 11, 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

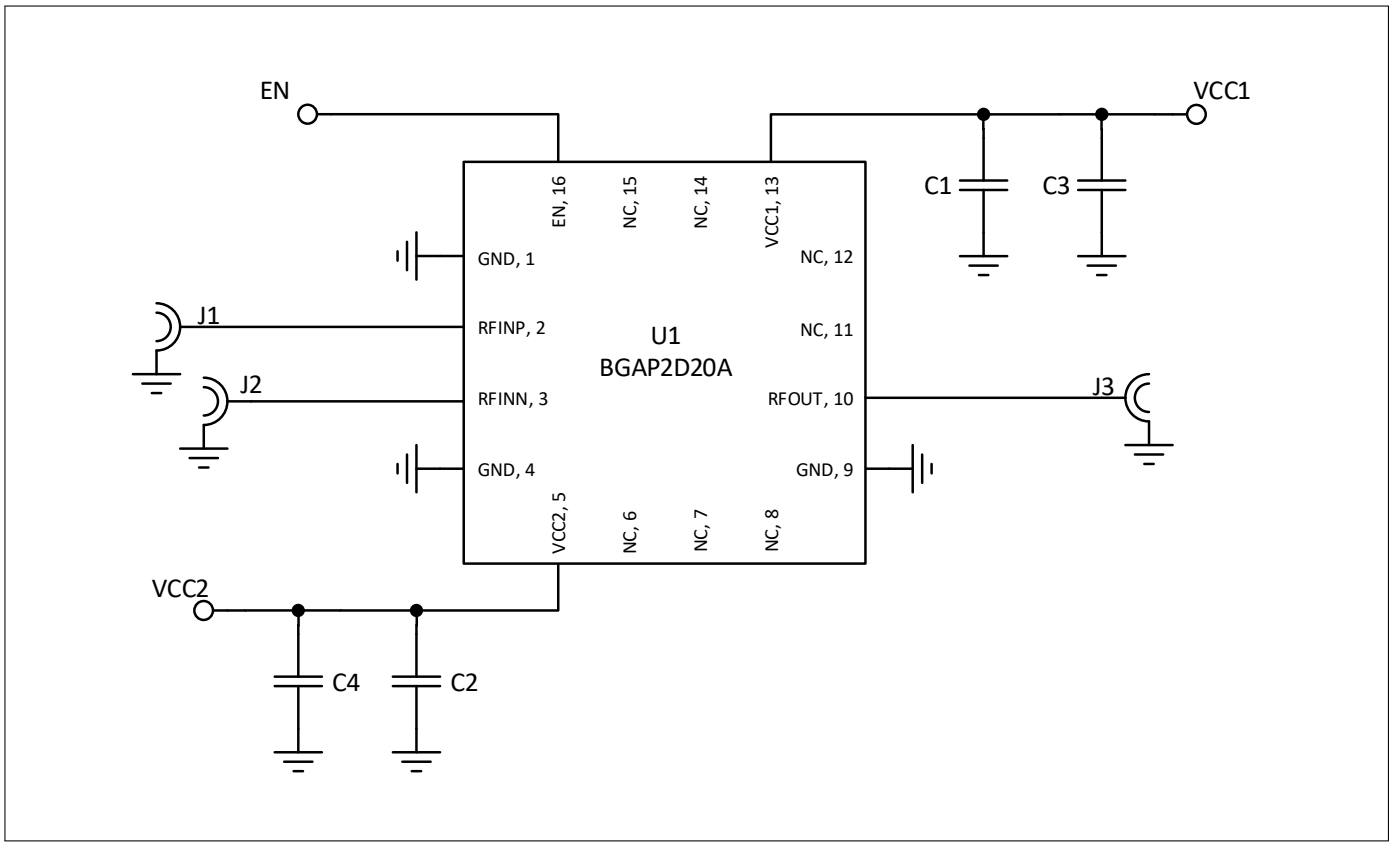


Figure 3: BGAP2D20A Application Schematic

Table 6: Bill of Materials Table

Name	Value	Description	Part Number	Manufacturer
C1, C2	10nF	Capacitor, X7R, 0402	–	Various
C3, C4	1uF	Capacitor, X7R, 0402	–	Various
J1, J2, J3	–	Connector, SMA	–	Various
U1	–	Pre-driver, PG-TSNP-16-12	BGAP2D20A	Infineon

8 Package Information

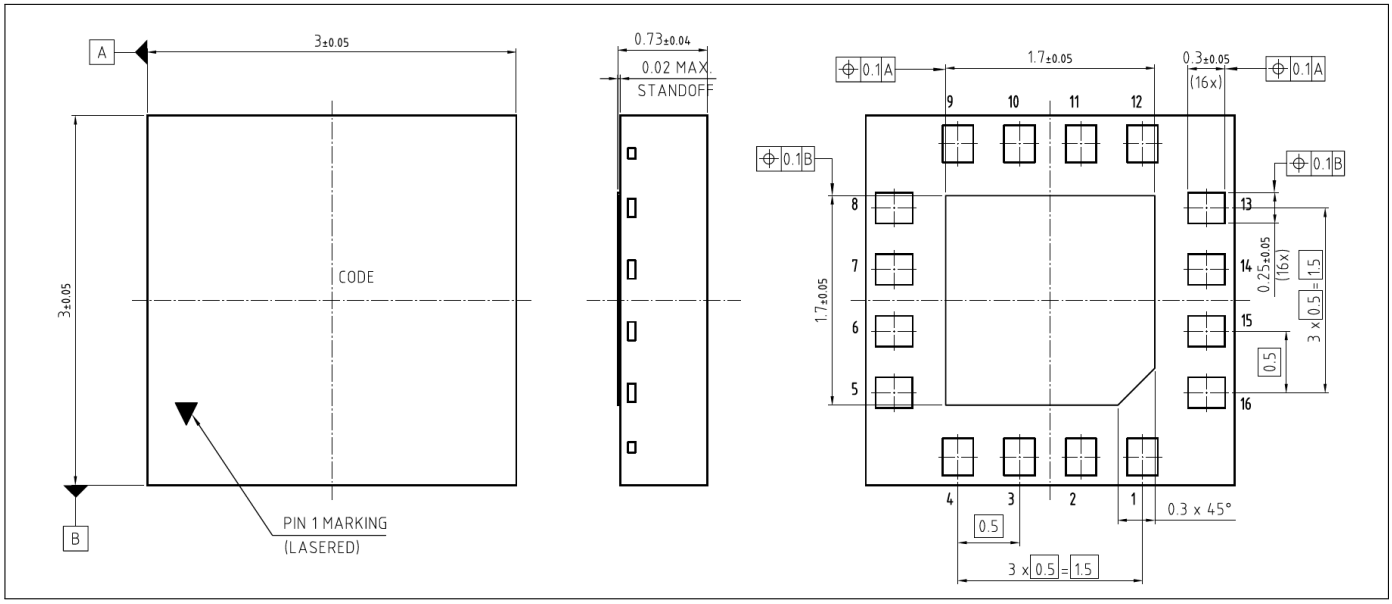


Figure 4: PG-TSNP-16-12 Package Outline (3.0mm x 3.0mm x 0.73mm)

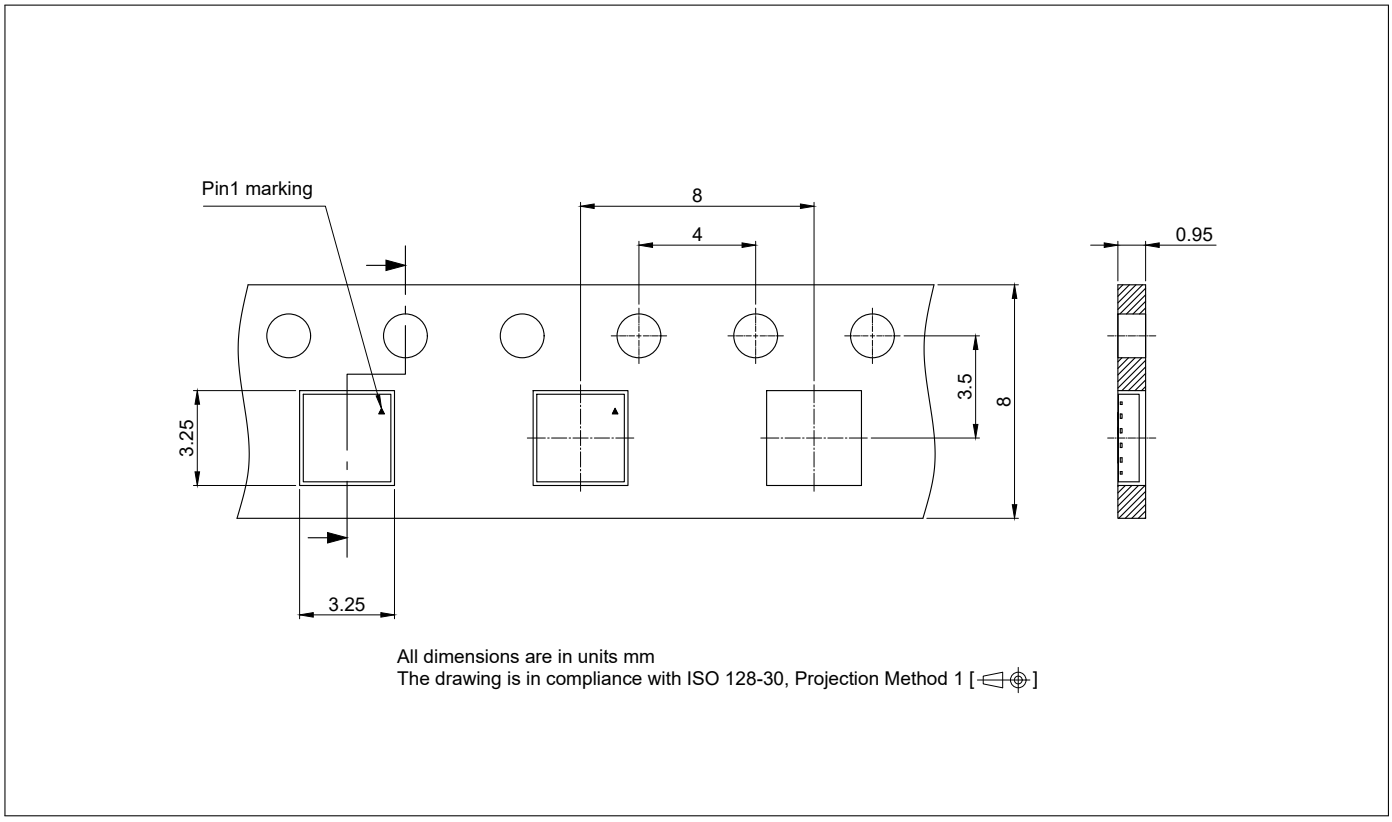


Figure 5: PG-TSNP-16-12 Carrier Tape

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
all	Preliminary, Revision v1.0 - 2023-06-01
all	Preliminary, Revision v1.1 - 2023-08-03 Package changed to 16-12

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