

FEATURES

- Supports 802.11ac high-data rate standard
- Fully integrated FEIC including 2 GHz Power Amplifier, Low Noise Amplifier with Bypass mode and SP3T TX/RX/BT Switch
- 1.8% Dynamic EVM @ $P_{OUT} = +18$ dBm with IEEE 802.11ac, MCS8-HT20 Waveform
- 28 dB of Linear Power Gain
- 0.5 dB BT Band RF Switch Insertion Loss
- Power Detector with High Accuracy over 3:1 VSWR
- 2.2 dB RX Path Noise Figure with 14.5 dB Gain LNA Mode
- Single 3.0 to 4.8 V Supply Voltage
- 50 Ω -Internally Matched RF Ports
- Leadfree and RoHS Compliant
- 3.0 x 3.0 x 0.6 mm QFN Package

APPLICATIONS

- 802.11b/g/n/ac for WLAN enabled:
 - Access Points
 - Media Gateways
 - Set-top boxes

PRODUCT DESCRIPTION

The ANADIGICS AND0281 is a high performance InGaP HBT FEIC that incorporates a 2.4 GHz Power Amplifier, Low Noise Amplifier, RF Switch and Power Detector. The FEIC is designed for WLAN transmit and receive applications in the 2.4 - 2.5 GHz band. Matched to 50 Ohms and DC blocked at all RF inputs and outputs, the part requires no additional RF matching components off-chip.

The antenna port is switched between WLAN transmit, WLAN receive and BlueTooth with low loss switches. The integrated power detector circuit facilitates accurate power control under varying load conditions.

All circuits are biased by a single +3.6 V supply and consume ultra low current in the OFF mode. The PA exhibits unparalleled linearity and efficiency for 802.11b/g/n/ac WLAN systems under the toughest signal conditions within these standards.

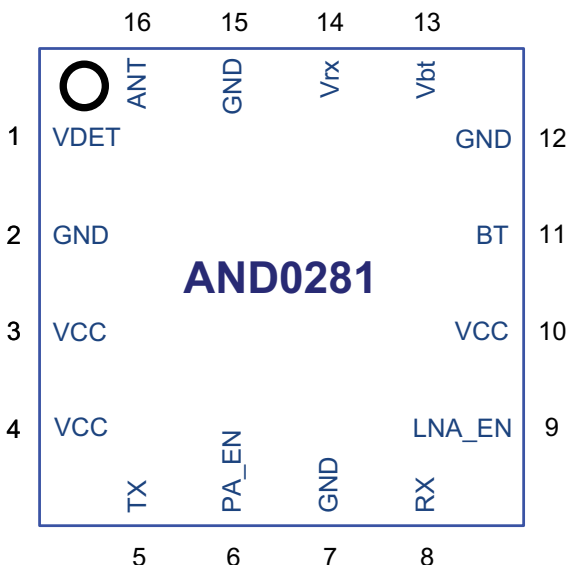


Figure 1: Pinout Diagram

The AND0281 is manufactured using advanced InGaP HBT technology that offers state-of-the-art performance, reliability, temperature stability and ruggedness.

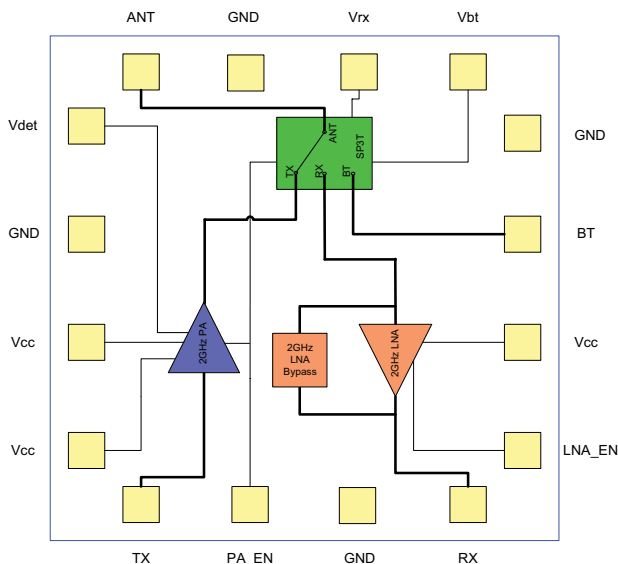


Figure 2: Block Diagram

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	VDET	Power detector output
2	GND	Ground
3	V _{CC}	Power Supply. Bias for the transistors in the part.
4	V _{CC}	Power Supply. Bias for the transistors in the part.
5	TX	RF transmit input port
6	PA_EN	Power Amplifier Enable. On/Off control for the Tx path power amplifier
7	GND	Ground
8	RX	RF receive output port
9	LNA_EN	LNA Enable. On/Off control for the Rx path low noise amplifier
10	V _{CC}	Power Supply. Bias for the transistors in the part.
11	BT	Bluetooth RF port
12	GND	Ground
13	V _{bt}	Bluetooth enable. On/Off control for Bluetooth RF path.
14	V _{rx}	Switch control for receive path
15	GND	Ground
16	ANT	Antenna Port. Common connection for the PA, LNA, and Bluetooth paths

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT	COMMENTS
DC Power Supply	-	+6.0	V	
RF Input Level, 2.4 GHz PA	-	+5	dBm	Modulated
Operating Ambient Temperature	-40	+85	°C	
Storage Temperature	-55	+125	°C	
Storage Humidity	-	60	%	
Junction Temperature	-	150	°C	
ESD Tolerance	1000	-	V	Human body model (HBM)
MSL Rating	MSL-1	-	-	

Functional operation to the specified performance is not implied under these conditions. Operation of any single parameter in excess of the absolute ratings may cause permanent damage. No damage occurs if one parameter is set at the limit while all other parameters are set within normal operating ranges.

Table 3: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency Ranges	2400	-	2500	MHz	802.11b/g/n/ac
DC Power Supply Voltage (Vcc)	+3.0	+3.3	+4.8	V	With RF applied
Control Pin Voltage (PA_EN, LNA_EN, Vrx, Vbt)	+2.8 0	+3.2 0	+4.8 +0.4	V	Logic High/On Logic Low/Off
Operating Temperature	-40	-	+85	°C	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Table 4: Electrical Specifications - TX Mode
(T_C = +25°C, V_{CC} = +3.3V, PA_EN = +3.2V, V_{rx} = 0.0V, V_{bt} = 0.0V, LNA_EN = 0.0V)
64 QAM OFDM 54 Mbps

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	2400		2500	MHz	
Power Gain	26	28	30	dB	
Gain Flatness		+/-0.25		dB	
Error Vector Magnitude (EVM)		-27 210		dB mA	P _{OUT} = 20 dBm, Dyn Mode 54 Mbps data rate, Avg during packet
		-36 160	-32	dB mA	P _{OUT} = 16 dBm, Dyn Mode 54 Mbps data rate, Avg during packet
		-42 130		dB mA	P _{OUT} = 5 dBm, Dyn Mode 54 Mbps data rate, Avg during packet
Transmit Mask		22 23.5 20 19.5		dBm	802.11b DBPSK 1 Mbps data rate, Raised Root Cosine filtering. 802.11b DBPSK 1 Mbps data rate, Gaussian filtering. 802.11n MCS0-HT20 802.11n MCS0-HT40
PA Noise Figure		5		dB	
Input Return Loss		12		dB	
Output Return Loss		12		dB	
Output Spurious Levels - Harmonics 2 fo 3 fo 4 fo		-20 -40 -30		dBm/ MHz	For Power levels up to 22 dBm 1 Mbps CCK
Settling Time		0.5		uS	Within 0.5 dB of final value
Quiescent Current (I _{cq})		120		mA	

Table 5: Electrical Specifications - Tx Mode(T_c = +25°C, V_{cc} = +3.3V, PA_EN = +3.2V, V_{rx} = 0.0V, V_{bt} = 0.0V, LNA_EN = 0.0V) 802.11n/ac

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	2400		2500	MHz	
Error Vector Magnitude (EVM) and Current Consumption		-34 195		dB mA	P _{OUT} = 19 dBm, MCS7 - HT20
		-35 180	235	dB mA	P _{OUT} = 18 dBm, MCS8 - HT20
		-38 170		dB mA	P _{OUT} = 17 dBm, MCS9 - HT40
Transmit Mask	Pass			N/A	802.11n, 802.11ac at respective modulation and power levels noted above

Table 6: Electrical Specifications - TX Mode Power Detector(T_c = +25°C, V_{cc} = +3.3V, PA_EN = +3.2V, V_{rx} = 0.0V, V_{bt} = 0.0V, LNA_EN = 0.0V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Detector Voltage		200 300 750 950		mV	P _{OUT} = 0 dBm P _{OUT} = 10 dBm P _{OUT} = 18 dBm P _{OUT} = 22 dBm
Total Internal Load Impedance		1.5		kΩ	
Load Accuracy		+/-0.5		dB	Output Power variation at 3:1 VSWR all phases
Detector Directivity		19		dB	Output Power variation at 3:1 VSWR all phases

Table 7: Electrical Specification - RX LNA Mode(T_c = +25°C, V_{cc} = +3.3V, LNA_EN = +3.2V, V_{rx} = +3.2V, V_{bt} = 0.0V, PA_EN = 0.0V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	2400		2500	MHz	
Gain - LNA Mode	10.5	14.5	16	dB	
Gain Flatness		+/-0.25		dB	Across any 40 MHz band
Rx Noise Figure		2.2		dB	
Input Return Loss		5		dB	
Output Return Loss		12		dB	
IIP3		0		dBm	
Settling Time		0.5		μs	Within 0.5 dB of final value
Rx Current		9		mA	

Table 8: Electrical Specification - RX Bypass Mode
(T_c = +25°C, V_{cc} = +3.3V, V_{rx} = +3.2V, LNA_EN = 0.0V, V_{bt} = 0.0V, PA_EN = 0.0V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	2400		2500	MHz	
Gain - RX Bypass Mode	-7	-6	-4	dB	
Gain Flatness		+/-0.25		dB	Across any 40 MHz band
Rx Noise Figure		6		dB	
Input Return Loss		12		dB	
Output Return Loss		12		dB	
IIP3		+23		dBm	
Settling Time		0.5		uS	Within 0.5 dB of final value

Table 9: Electrical Specifications - Bluetooth Path
(T_c = +25°C, V_{cc} = +3.3V, V_{rx} = 0.0V, V_{bt} = +3.2V, PA_EN = 0.0V, LNA_EN = 0.0V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	2400	-	2500	MHz	
Insertion Loss	-	0.5	-	dB	
Gain Flatness	-	+/-0.25	-	dB	Across any 40 MHz band
Input Return Loss	-	10	-	dB	
Output Return Loss	-	10	-	dB	
BT - RX Isolation	-	20	-	dB	BT to RX
BT - TX Isolation	-	30	-	dB	BT to TX
Settling Time	-	0.5	1.0	μs	

Table 10: Electrical Specifications - Switch and Control Pin
(T_c = +25°C, V_{cc} = +3.3V, V_{control} High = +3.2V, V_{control} Low = 0.0V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Control Pin Steady State Input Current (PA_EN)		10 0.5		uA uA	Logic Hi/On Logic Low/OFF
Control Pin Steady State Input Current (Vbt, Vrx)		10 0.5		uA uA	Logic Hi/On Logic Low/OFF
Control Pin Steady State Input Current (LNA_EN)		300 0.5		uA uA	Logic Hi/On Logic Low/OFF
Leakage Current		3		uA	Total from all bias Pins, Controls in OFF mode V _{cc} = 3.6V
TX-RX Isolation		36		dB	

Table 11: Switch Modes of Operation

MODES OF OPERATION	PA_EN	LNA_EN	Vrx	Vbt
TX	HIGH	LOW	LOW	LOW
RX	LOW	HIGH	HIGH	LOW
RX Bypass	LOW	LOW	HIGH	LOW
BT	LOW	LOW	LOW	HIGH
Power On Reset	LOW	LOW	LOW	LOW

APPLICATION Schematic

Although not shown in the schematic, a large value capacitor ($\sim 10\text{ }\mu\text{F}$) should be connected to the voltage supply lines for low frequency decoupling.

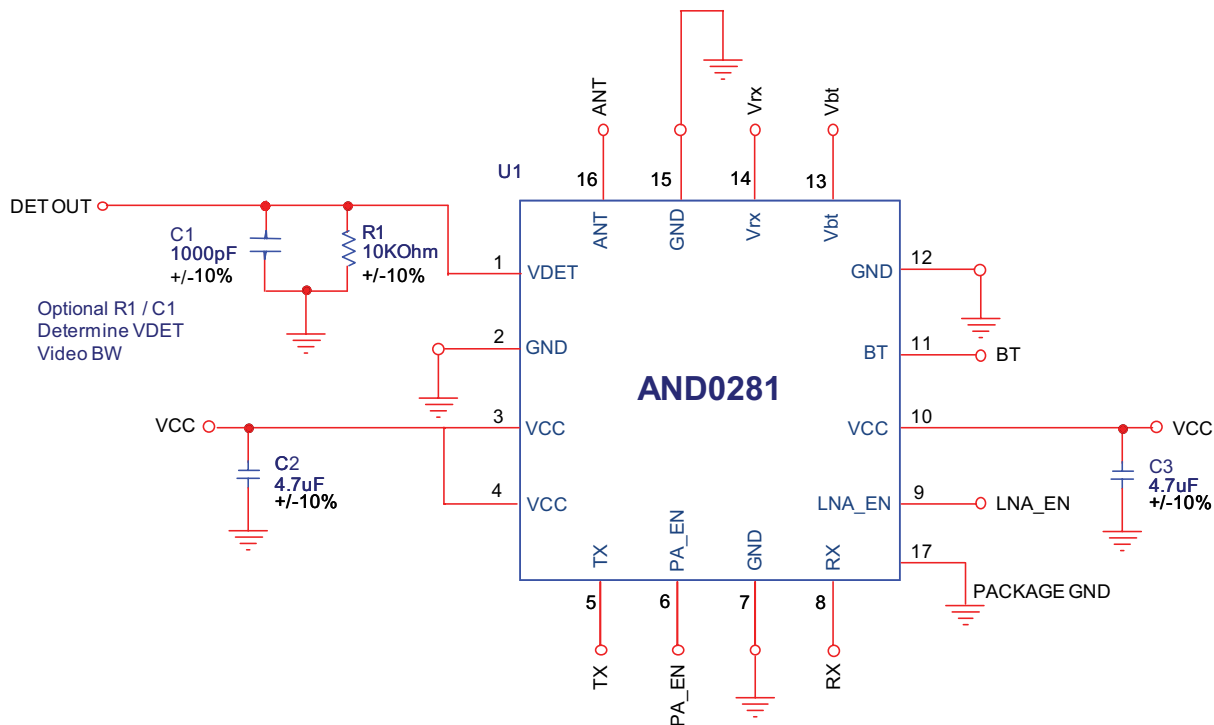
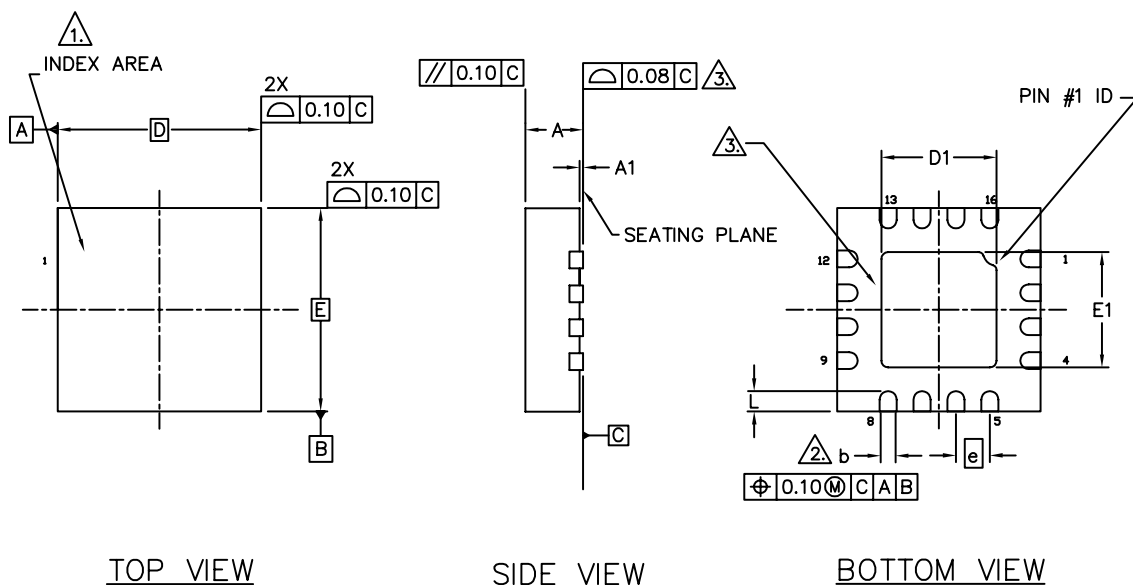


Figure 3: Recommended Application Schematic

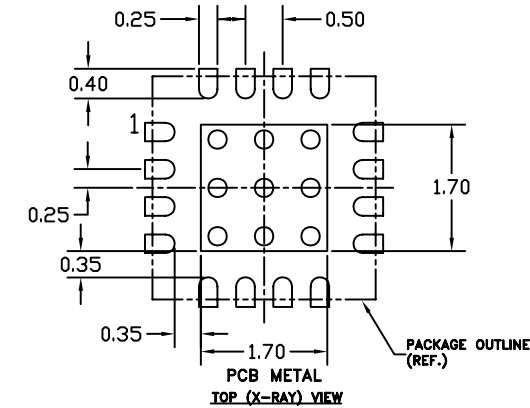


SYMBOL	DIMENSIONS—MM			NOTE
	MIN.	NOM.	MAX.	
A	0.50	0.55	0.60	
A1	0.00	0.02	0.05	
b	0.18	0.25	0.30	
D	3.00 BSC			
D1	1.55	1.70	1.80	
E	3.00 BSC			
E1	1.55	1.70	1.80	
e	0.50 BSC			
L	0.20	0.30	0.40	

NOTES :

1. TERMINAL #1 IDENTIFIER AND PAD NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012.
2. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM TERMINAL TIP.
3. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

Figure 4: Package Outline Drawing

**NOTES:**

- (1) OUTLINE DRAWING REFERENCE:
98001-TBD
- (2) UNLESS SPECIFIED DIMENSIONS
ARE SYMMETRICAL ABOUT CENTER
LINES SHOWN.
- (3) DIMENSIONS IN MILLIMETERS.
- (4) VIAS SHOWN IN PCB METAL VIEW
ARE FOR REFERENCE ONLY.
NUMBER & SIZE OF THERMAL VIAS
REQUIRED DEPENDENT ON HEAT
DISSIPATION REQUIREMENT AND THE
PCB PROCESS CAPABILITY.
- (5) RECOMMENDED STENCIL THICKNESS:
APPROX. 0.125mm (5 Mils)

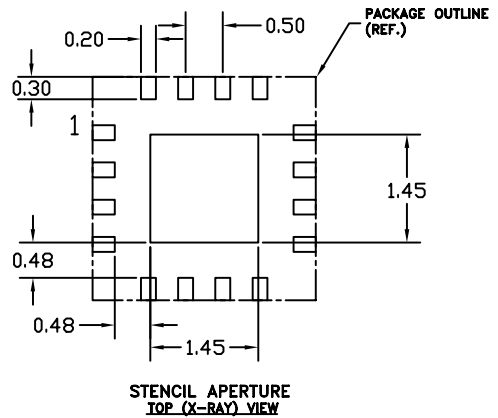
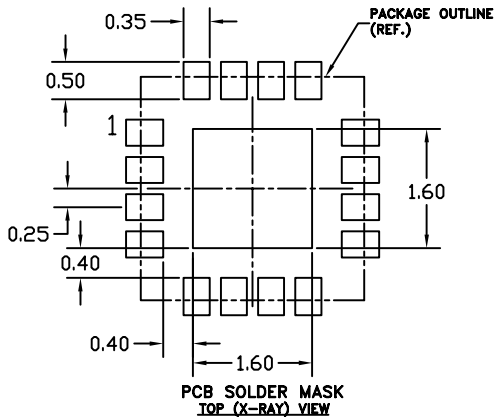


Figure 4: Recommended PCB Layout

ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AND0281P7	-40 °C to +85 °C	16 pin, 3.0 x 3.0 x 0.6 mm Surface Mount Module	Bags
AND0281P9	-40 °C to +85 °C	16 pin, 3.0 x 3.0 x 0.6 mm Surface Mount Module	Partial Reel
AND0281Q7	-40 °C to +85 °C	16 pin, 3.0 x 3.0 x 0.6 mm Surface Mount Module	2500 piece T/R
EVB0281	-40 °C to +85 °C	Evaluation Board	Evaluation Board

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