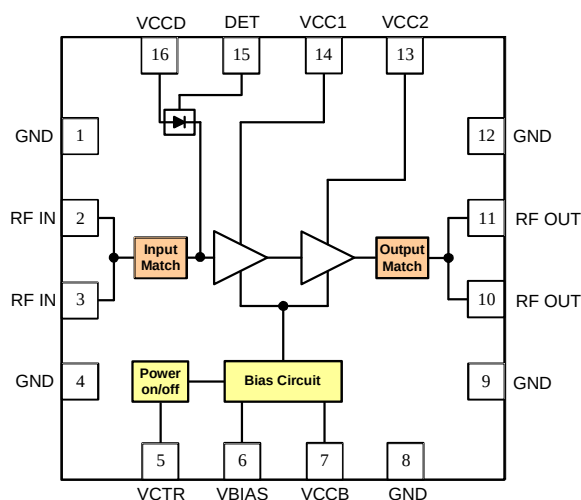


Features

- 4.9~5.9GHz Frequency Range
- 3.3V~5.5V Operation
- 3.0% EVM@24dBm for 802.11a 54Mbps, 5.5V
- 3.0% EVM@22.5dBm for 802.11a 54Mbps, 5V
- 2.5% EVM@18dBm for 802.11a 54Mbps, 3.3V
- 240mA Quiescent Current
- 22dB Gain (Typ)
- >20dB Input Return Loss@5.8GHz
- On-Chip Power Detector



Functional Block Diagram

Applications

- IEEE 802.11a/n WLAN
- C band application
- 5.8GHz RFID
- Spread-Spectrum and MMDS Systems

Product Description

The AC552228 is a 2-stage 4.9-5.9GHz high efficiency, high linearity power amplifier based on InGaP/GaAs HBT technology. The amplifier provides a typical gain of 22 dB and P1dB power of 30.5 dBm, typical bias condition is 5.5V at 240 mA. The input and output are internally matched to 50Ω and require a minimum of external matching components to cover the entire 4.9GHz to 5.9GHz. The AC552228 is assembled in a 16-pin, 4mm×4mm, QFN package.

Ordering Information

- AC552228 5.8GHz Linear Power Amplifier
- AC552228EVB-1 5.2GHz to 5.8GHz Evaluation PCB
- AC552228EVB-2 5.6GHz to 5.9GHz Evaluation PCB

AC552228 4.9GHz to 5.9GHz LINEAR POWER AMPLIFIER

Pin Description

Pin No.	Symbol	Description
1, 4, 8, 9, 12	NC/GND	No connection or Ground connection
2, 3	RF IN	RF input
5	VCTR	Power on/off control voltage
6	VBIAS	Bias voltage
7	VCCB	Supply voltage for bias
10, 11	RF OUT	RF output
13 / 14	VCC2 / VCC1	Supply voltage for the 2 nd / 1 st stage
15	DET	Provides an output voltage proportional to the RF level
16	VCCD	Supply voltage for power detector
Pkg Base	GND	Ground connection

Absolute Maximum Ratings

Parameter	Rating	Unit
Input RF Power	+15	dBm
Supply Voltage	-0.5 to +7.0	V
Bias Voltage	-0.5 to +4.0	V
DC Supply Current	1000	mA
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C



Caution! ESD sensitive device.

ESD Rating: Class1C
Value: Passes ≥ 1000 V min.
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV
Value: Passes ≥ 1000 V min.
Test: Charged Device Model (CDM)
Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 3 at +260 °C convection reflow
Standard: JEDEC Standard J-STD-020

Electrical Specifications

Table 1 Test Frequency: 5.6 to 5.9GHz (VCC1, VCC2 = 5.5 V, Temp = +25°C)

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Compliance and Nominal Conditions					VCC=5.5V, ICC=240mA, Temp=+25°C, Freq=5.6GHz to 5.9GHz
Frequency Range	5.6	5.8	5.9	GHz	
Output Power@1dB Compression		30.5		dBm	VCC=5.5V@5.8 GHz
Gain		21.5		dB	VCC=5.5V@5.8 GHz
EVM		3.0	3.2	%	Pout=+24dBm, VCC =5.5V@5.8 GHz 802.11a, 54 Mbps, 64QAM
Power Supply					
Operating Voltage		5.5		V	
Bias Voltage		2.83		V	
Quiescent Current (Total)		240		mA	

AC552228 4.9GHz to 5.9GHz LINEAR POWER AMPLIFIER

(VCC1, VCC2 = 5.0 V, Temp = +25°C)

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Compliance and Nominal Conditions					VCC =5.0V, ICC=240mA, Temp=+25°C, Freq=5.6GHz to 5.9GHz
Frequency Range	5.6	5.8	5.9	GHz	
Output Power@1dB Compression		29.5		dBm	VCC=5.0V@5.8 GHz
Gain		22		dB	VCC=5.0V@5.8 GHz
EVM		3.0		%	Pout=+22.5dBm, VCC =5.0V@5.8 GHz 802.11a, 54 Mbps, 64QAM
Power Supply					
Operating Voltage		5.0		V	
Bias Voltage		2.87		V	
Quiescent Current (Total)		240		mA	

AC552228 4.9GHz to 5.9GHz LINEAR POWER AMPLIFIER

Table 2 Test Frequency: 5.2 to 5.8GHz**(VCC1, VCC2 = 5.0 V, Temp = +25°C)**

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Compliance and Nominal Conditions					VCC =5.0V, ICC=300mA, Temp=+25°C, Freq=5.2GHz to 5.8GHz
Frequency Range	5.2	5.5	5.8	GHz	
Output Power		28	28.5	dBm	VCC=5.0V@5.5 GHz
Gain		22		dB	VCC=5.0V@5.5 GHz
EVM		3.2		%	Pout=+27dBm, VCC =5.0V@5.5 GHz 802.16d, 64QAM
		3.2		%	Pout=+22dBm, VCC =5.0V@5.5 GHz 802.11a, 54 Mbps, 64QAM
		3.3		%	Pout=+22dBm, VCC =5.0V@5.5 GHz 802.11n, 81 Mbps, QPSK
Power Supply					
Operating Voltage		5.0		V	
Bias Voltage		3.0		V	
Quiescent Current (Total)		300		mA	

(VCC1, VCC2 = 3.3 V, Temp = +25°C)

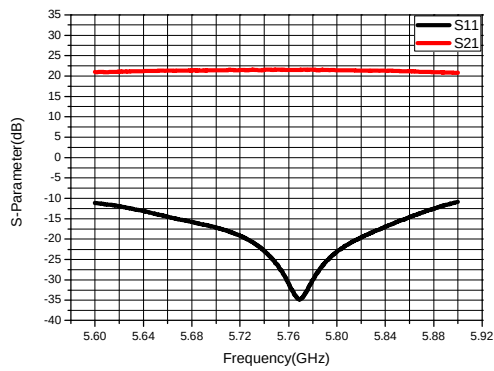
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Compliance and Nominal Conditions					VCC =3.3V, ICC=300mA, Temp=+25°C, Freq=5.2GHz to 5.8GHz
Frequency Range	5.2	5.5	5.8	GHz	
Output Power		25	25.5	dBm	VCC=3.3V, ICC=300mA@5.5 GHz
Gain		21		dB	VCC=3.3V@5.5 GHz
EVM		2.6		%	Pout=+23dBm, VCC =3.3V@5.5 GHz 802.16d, 64QAM
		2.3		%	Pout=+18dBm, VCC =3.3V@5.5 GHz 802.11a, 54 Mbps, 64QAM
		2.4		%	Pout=+17dBm, VCC =3.3V@5.5 GHz 802.11n, 81 Mbps, QPSK
Power Supply					
Operating Voltage		3.3		V	
Bias Voltage		3.2		V	
Quiescent Current (Total)		300		mA	

Typical Performance Data

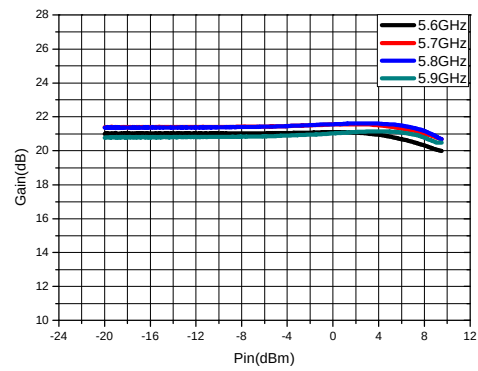
Test Frequency: 5.6 to 5.9GHz

(Test Condition: VCC=5.5V, ICC=240mA, T=25°C)

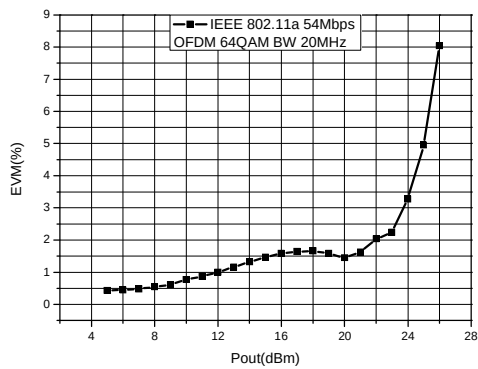
Small Signal Parameters



Power Gain vs. Input Power



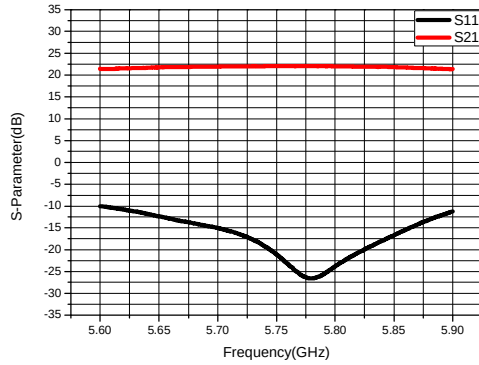
802.11a EVM vs. Output Power @5.8GHz



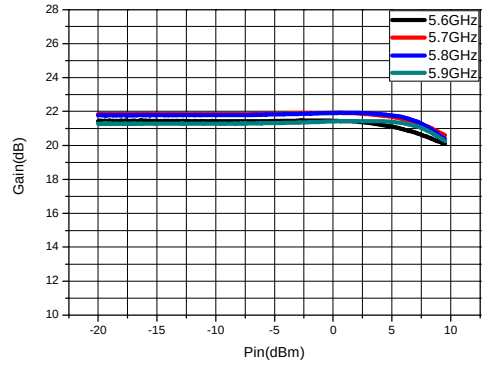
AC552228 4.9GHz to 5.9GHz LINEAR POWER AMPLIFIER

(Test Condition: VCC=5.0V, ICC=240mA, T=25°C)

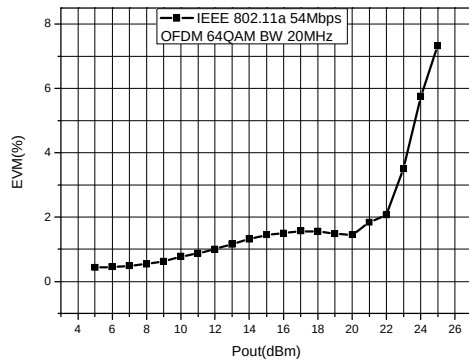
Small Signal Parameters



Power Gain vs. Input Power



802.11a EVM vs. Output Power @5.8GHz

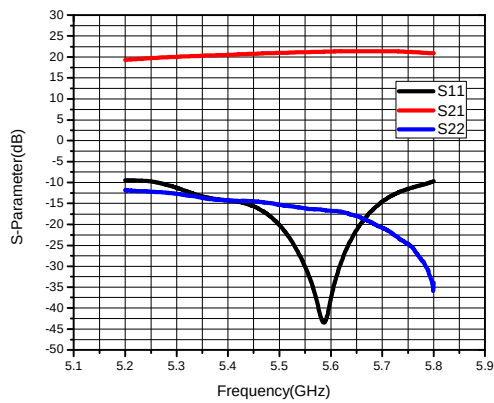


Typical Performance Data

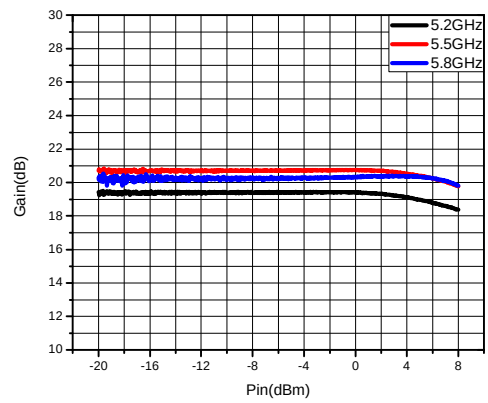
Test Frequency: 5.2 GHz to 5.8GHz

(Test Condition: VCC=5.0V, ICC=300mA, T=25°C)

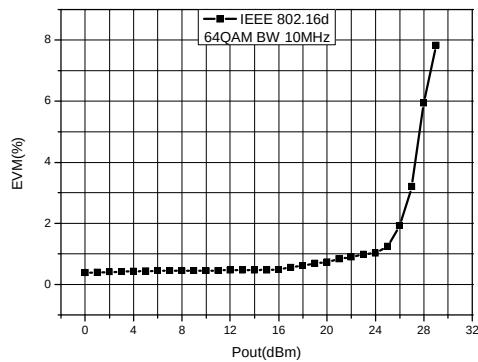
Small Signal Parameters



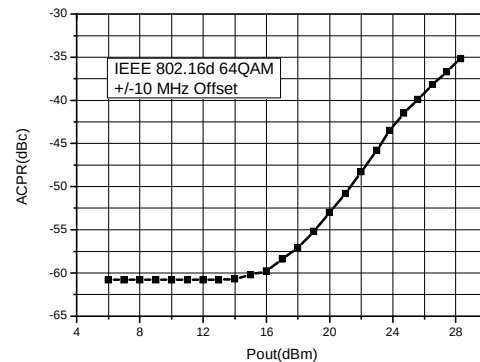
Power Gain vs. Input Power



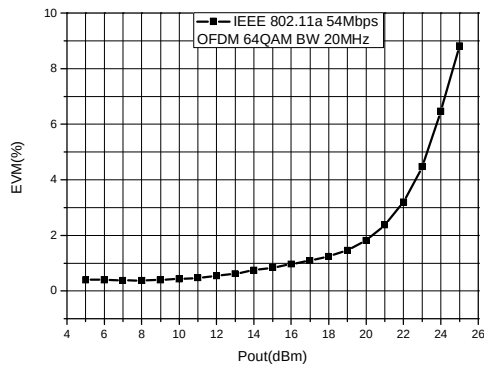
802.16d EVM vs. Output Power @5.5GHz



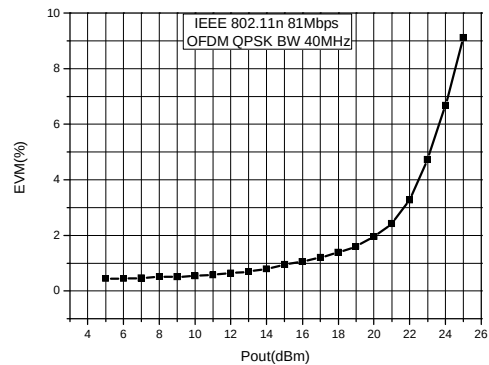
802.16d ACPR vs. Output Power @5.5GHz



802.11a EVM vs. Output Power @5.5GHz



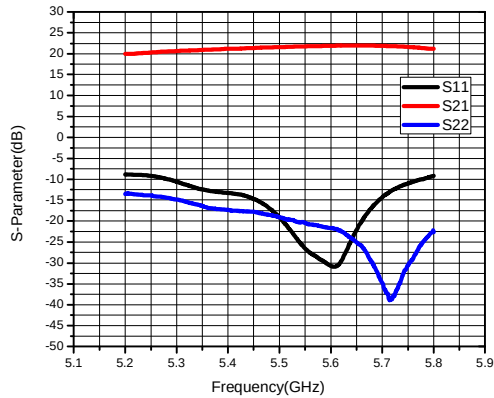
802.11n EVM vs. Output Power @5.5GHz



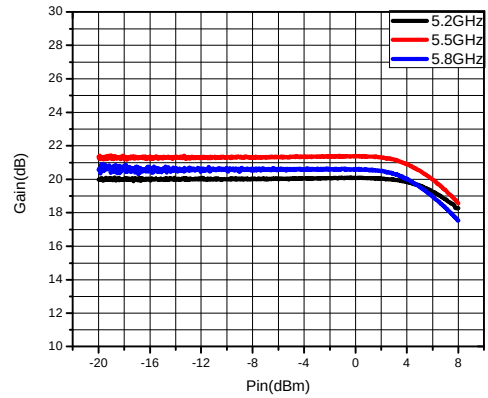
AC552228 4.9GHz to 5.9GHz LINEAR POWER AMPLIFIER

(Test Condition: VCC=3.3V, ICC=300mA, T=25°C)

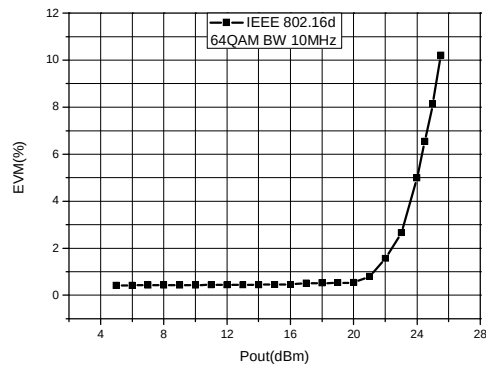
Small Signal Parameters



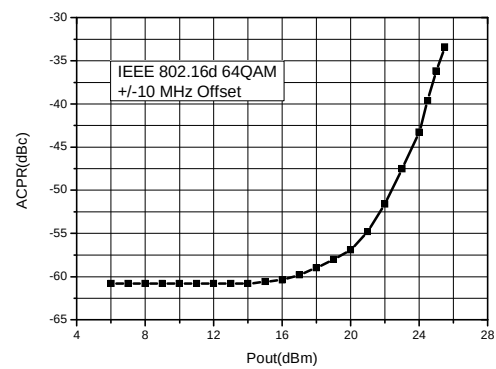
Power Gain vs. Input Power



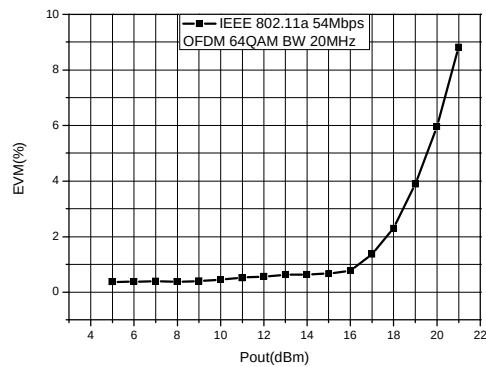
802.16d EVM vs. Output Power @5.5GHz



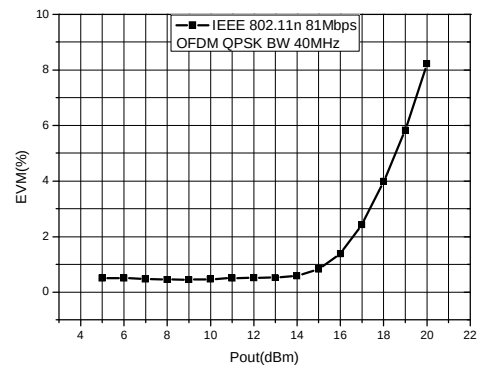
802.16d ACPR vs. Output Power @5.5GHz



802.11a EVM vs. Output Power @5.5GHz

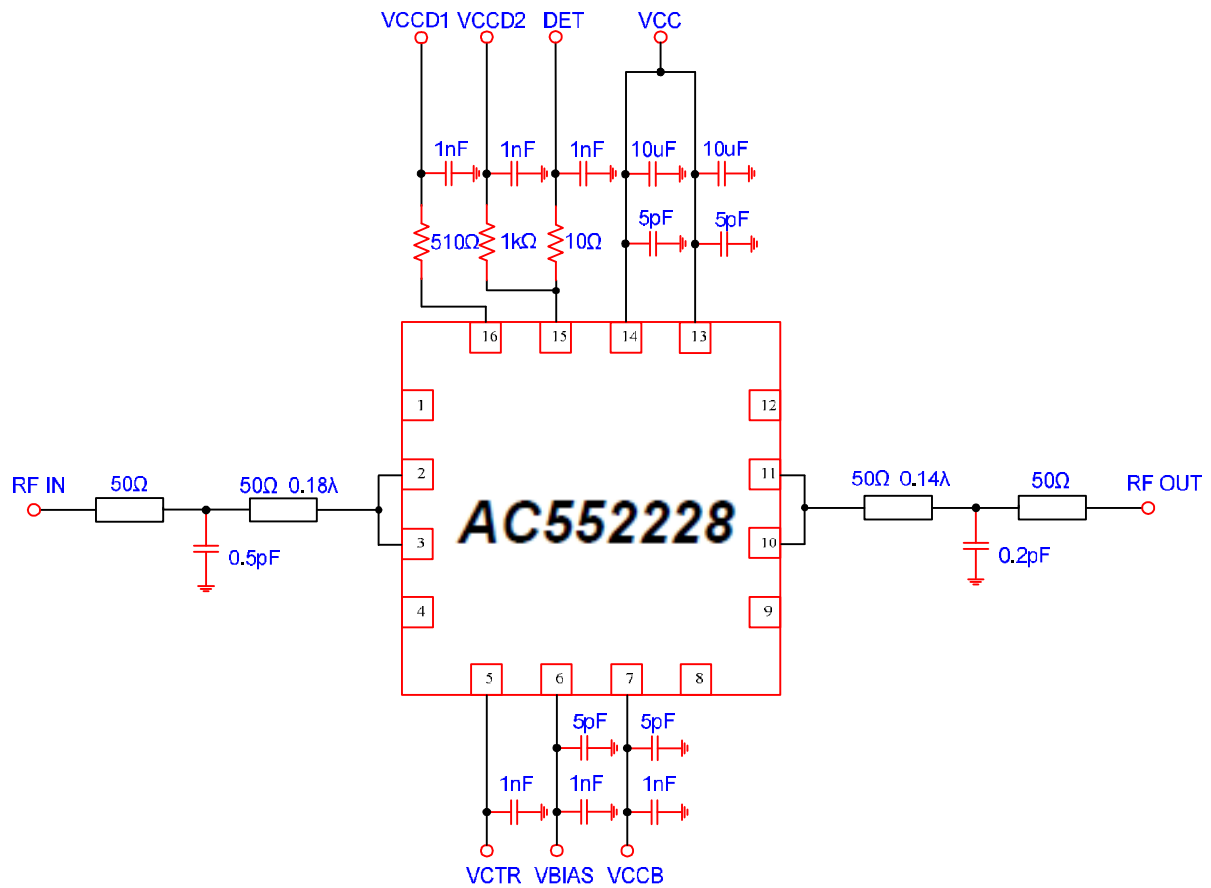


802.11n EVM vs. Output Power @5.5GHz



Evaluation Board Schematic

Test Frequency: 5.6 to 5.9GHz
(Supply Voltage Value refer to Table 1)

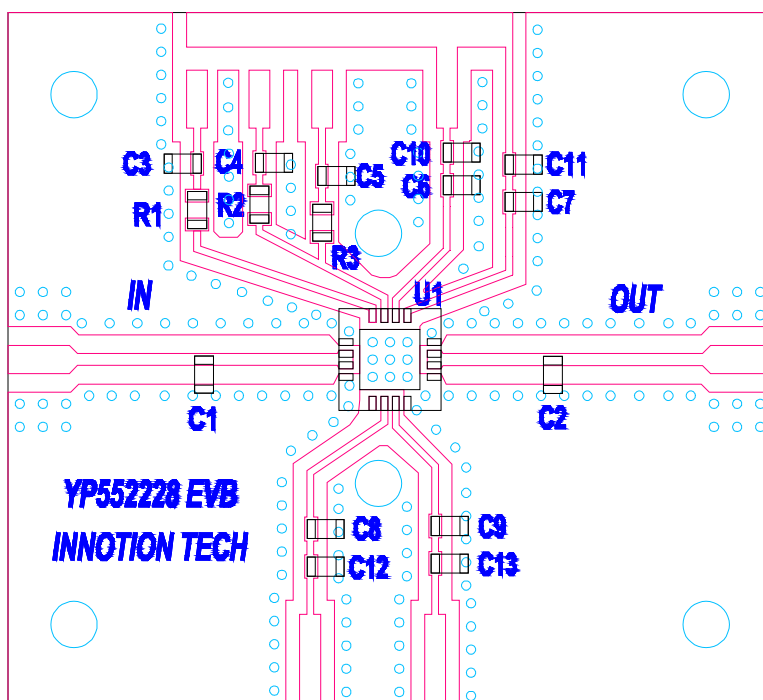


Evaluation Board Layout

Test Frequency: 5.6 to 5.9GHz

Board Size: 33mm×30mm

Board Thickness: 0.4 mm, Board Material: FR-4 ($\epsilon_r=4.5$)

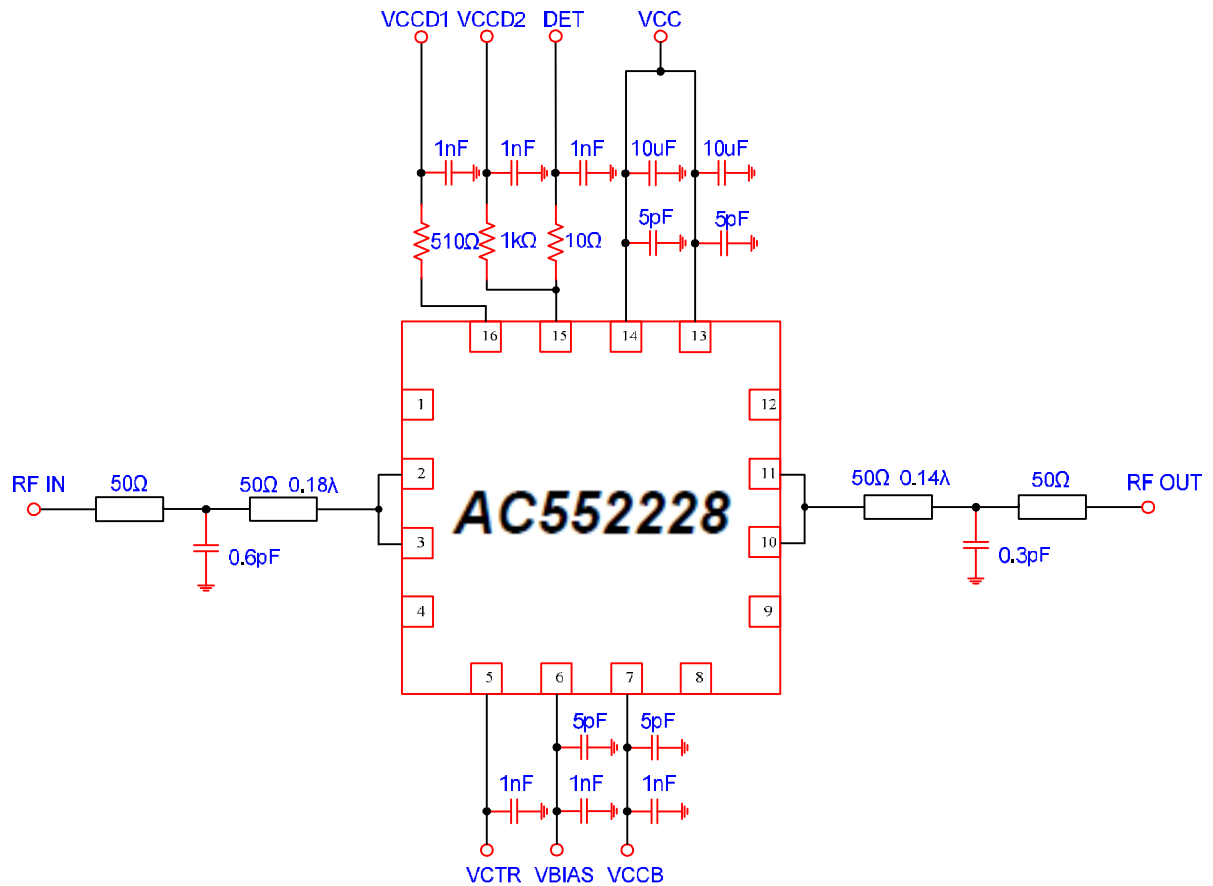


■ Table 4: Circuit Component Designations and Values

Component	Description	Manufacturer
C1	0.5pF Chip Capacitor	ATC
C2	0.2pF Chip Capacitor	ATC
C3,C4,C5,C12,C13	1nF Chip Capacitor	TDK
C6,C7,C8,C9	5pF Chip Capacitor	TDK
C10,C11	10uF Chip Capacitor	TDK
R1	510Ω Chip Resistor	YAGEO
R2	1kΩ Chip Resistor	YAGEO
R3	10Ω Chip Resistor	YAGEO
U1	AC552228	INNOGRATION

Evaluation Board Schematic

Test Frequency: 5.2 to 5.8GHz
(Supply Voltage Value refer to Table 2)

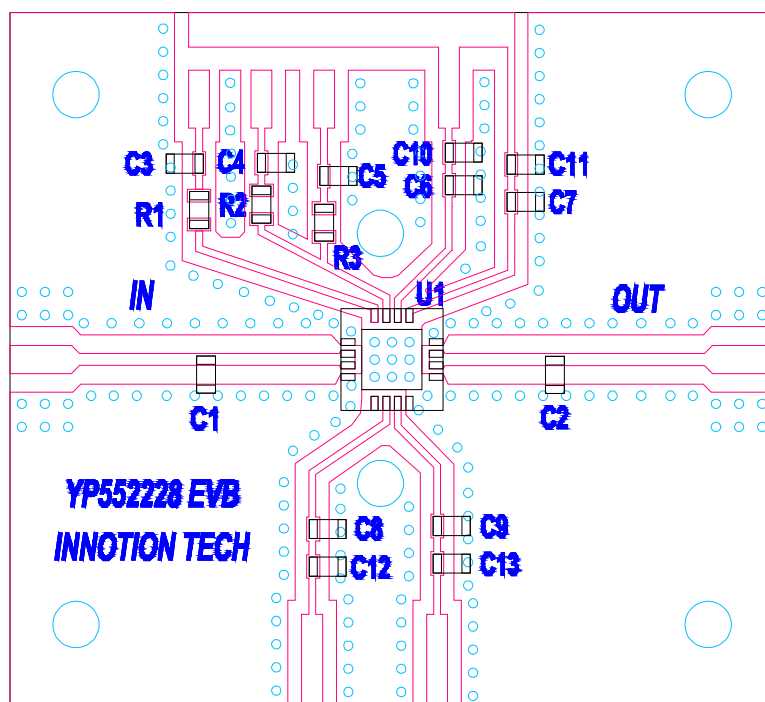


Evaluation Board Layout

Test Frequency: 5.2 to 5.8GHz

Board Size: 33mm×30mm

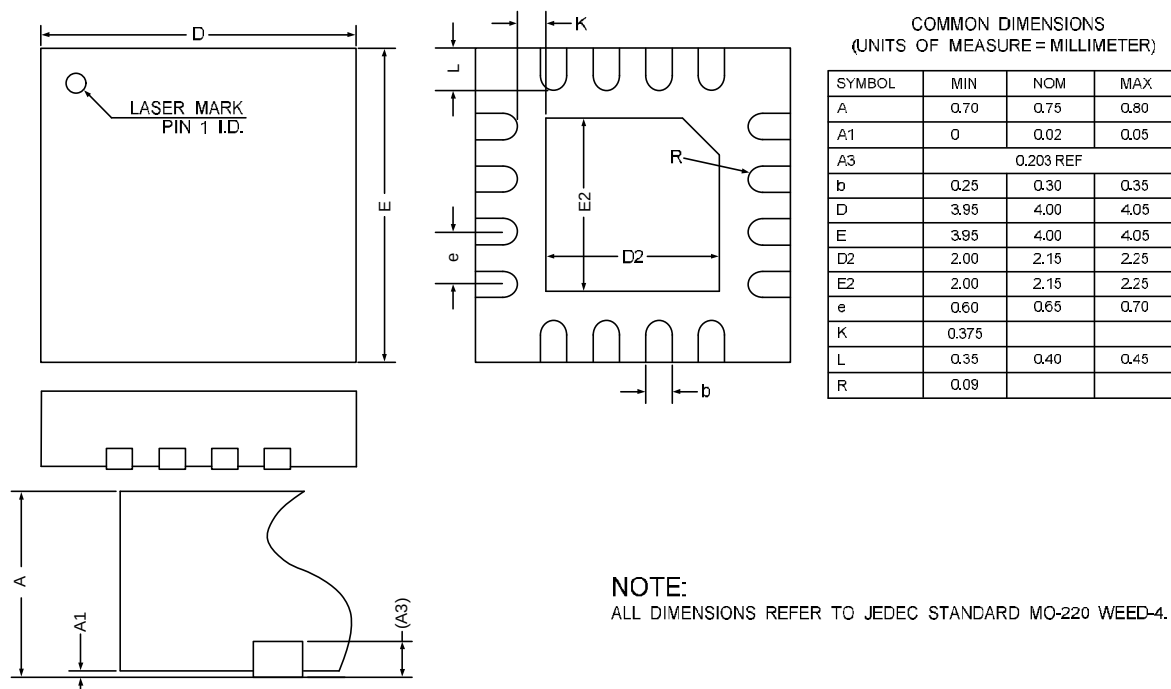
Board Thickness: 0.4mm, Board Material: FR-4 ($\epsilon_r=4.5$)



■ Table 5: Circuit Component Designations and Values

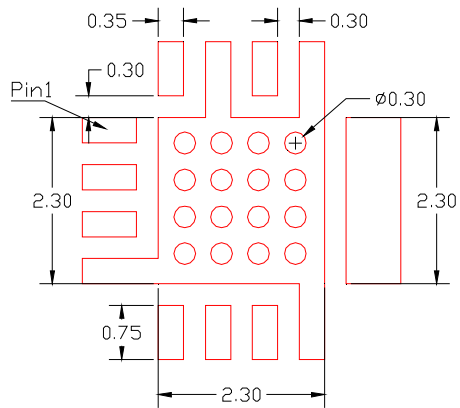
Component	Description	Manufacturer
C1	0.6pF Chip Capacitor	ATC
C2	0.3pF Chip Capacitor	ATC
C3,C4,C5,C12,C13	1nF Chip Capacitor	TDK
C6,C7,C8,C9	5pF Chip Capacitor	TDK
C10,C11	10uF Chip Capacitor	TDK
R1	510Ω Chip Resistor	YAGEO
R2	1kΩ Chip Resistor	YAGEO
R3	10Ω Chip Resistor	YAGEO
U1	AC552228	Innogrations

Packaging Diagram

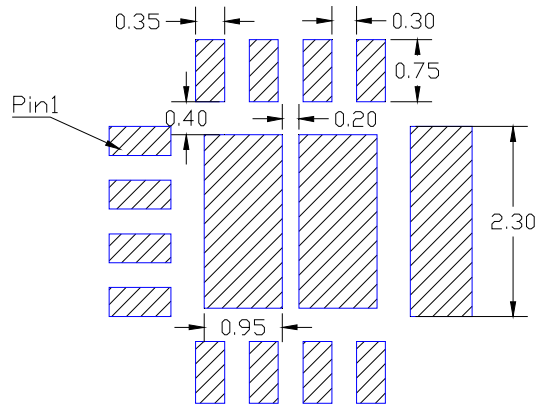


PCB Land Pattern and Stencil Outline

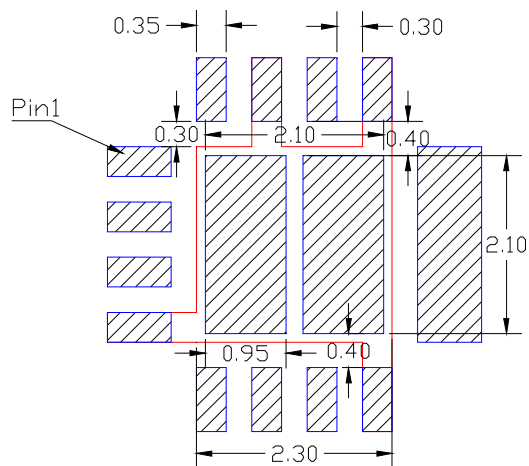
(Units: millimeters)



PCB Land Pattern (Top View)

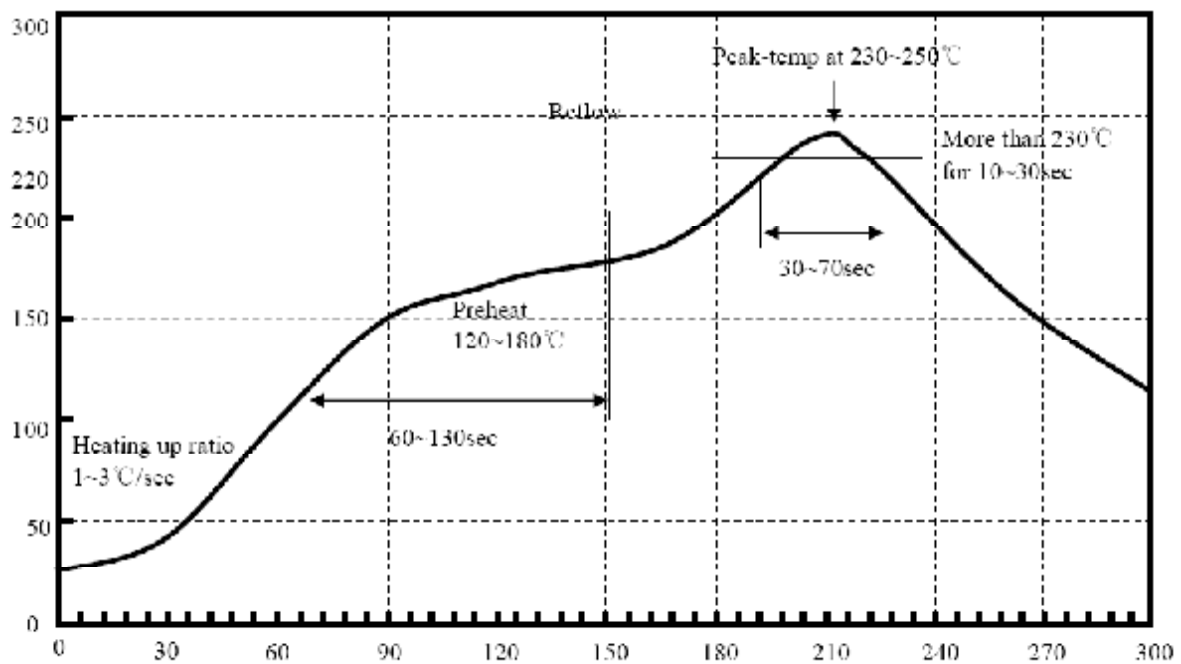


Stencil Outline



Combined PCB Land Pattern and Stencil Outline

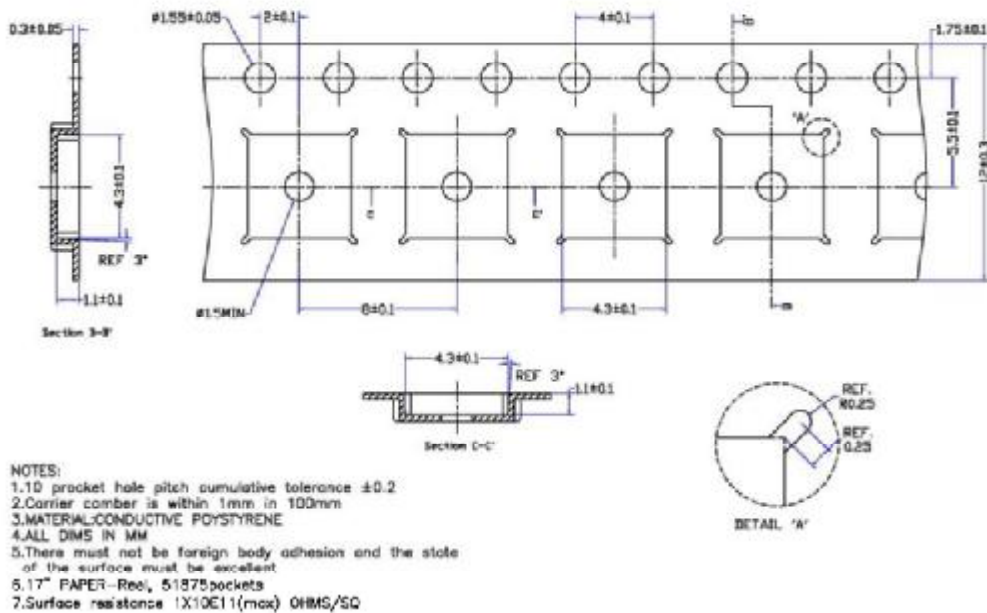
Recommended Solder Temperature



Recommended Temperature

Sn95.5Ag4.0Cu0.5

Tape dimensions and Orientation



Reel dimensions and Orientation

