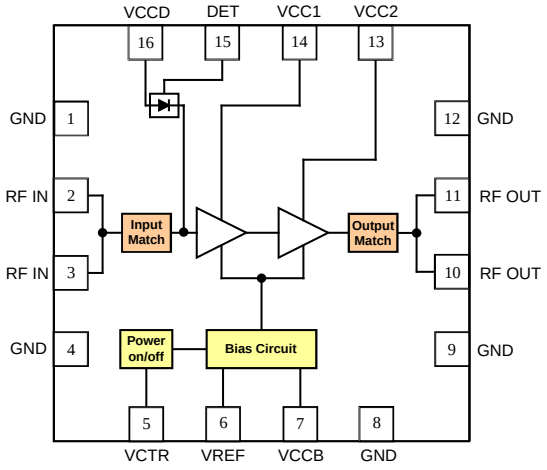
*RoHS & Pb-Free Product*

## Features

- 4.0~5.9GHz Frequency Range
- 3.3V~5.5V Supply Voltage
- 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
- IEEE 802.16 WiMax
- 5.8GHz RFID
- Spread-Spectrum and MMDS Systems

## Product Description

The YP552228 is a 2-stage 4.0-5.9GHz high efficiency, high linearity power amplifier based on InGaP/GaAs HBT technology, which is optimized for the applications in bands from 5200MHz to 5800MHz (It needs different matching circuit for different frequency range). 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 4.0GHz to 5.9GHz. The YP552228 is assembled in a 16-pin, 4mm×4mm, QFN package.

## Ordering Information

- YP552228 5.8GHz Linear Power Amplifier
- YP552228EVB-1 5.2GHz to 5.8GHz Evaluation PCB
- YP552228EVB-2 5.6GHz to 5.9GHz Evaluation PCB

## 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. Apply >2.5VDC to power down the power amplifier stages. Apply 0VDC to power up. If function is not desired, pin5 may be connected to GND |
| 6 | VREF | Bias voltage |
| 7 | VCCB | Supply voltage for bias |
| 10, 11 | RF OUT | RF output |
| 13 / 14 | VCC2 / VCC1 | Supply voltage for the 2nd / 1st 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 | Symbol | Rating | Unit |
|---|---|---|---|
| Input RF Power | RF IN | +14 | dBm |
| Supply Voltage | VCC1,VCC2, VCCB | -0.5 to +7.0 | V |
| Reference Voltage | VREF | -0.5 to +4.0 | V |
| Operating Ambient Temperature | $T_{OP}$ | -40 to +85 | °C |
| Storage Temperature | $T_{ST}$ | -40 to +150 | °C |

**Caution! ESD sensitive device.**

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

ESD Rating: Class IV
Value: Passes ≥1000V 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 1-1 Test Frequency: 5.6 to 5.9GHz, Supply Voltage=5.5V**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC1=VCC2=VCCB=5.5V, ICQ=240mA, $T_{OP}$= +25°C, Freq=5.6GHz to 5.9GHz |
| Frequency Range | 5.6 | 5.8 | 5.9 | GHz | |
| Output Power@1dB Compression | | 30.5 | | dBm | 5.8 GHz |
| Gain | | 21.5 | | dB | 5.8 GHz |
| EVM | | 3.0 | 3.2 | % | @Pout=+24dBm, 5.8 GHz 802.11a, 54 Mbps, 64QAM |
| **Power Supply** | | | | | |
| Reference Voltage, VREF | | 2.83 | | V | |
| Quiescent Current (Total), ICQ | | 240 | | mA | |

**Table 1-2 Test Frequency: 5.6 to 5.9GHz, Supply Voltage=5V**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC1=VCC2=VCCB=5V, ICQ =240mA, $T_{OP}$=+25°C, Freq=5.6GHz to 5.9GHz |
| Frequency Range | 5.6 | 5.8 | 5.9 | GHz | |
| Output Power@1dB Compression | | 29.5 | | dBm | 5.8 GHz |
| Gain | | 22 | | dB | 5.8 GHz |
| EVM | | 3.0 | | % | @Pout=+22.5dBm, 5.8 GHz 802.11a, 54 Mbps, 64QAM |
| **Power Supply** | | | | | |
| Reference Voltage, VREF | | 2.87 | | V | |
| Quiescent Current (Total), ICQ | | 240 | | mA | |

**Table 2-1 Test Frequency: 5.2 to 5.8GHz, Supply Voltage=5V**

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC1=VCC2=VCCB=5V, ICQ=300mA, $T_{OP}$=+25°C, Freq=5.2GHz to 5.8GHz |
| Frequency Range | 5.2 | 5.5 | 5.8 | GHz | |
| Output Power | | 28 | 28.5 | dBm | 5.5 GHz |
| Gain | | 22 | | dB | 5.5 GHz |
| EVM | | 3.2 | | % | @Pout=+27dBm, 5.5 GHz 802.16d, 64QAM |
| | | 3.2 | | % | @Pout=+22dBm, 5.5 GHz 802.11a, 54 Mbps, 64QAM |
| | | 3.3 | | % | @Pout=+22dBm, 5.5 GHz 802.11n, 81 Mbps, QPSK |
| **Power Supply** | | | | | |
| Reference Voltage, VREF | | 3.0 | | V | |
| Quiescent Current (Total), ICQ | | 300 | | mA | |

**Table 2-2 Test Frequency: 5.2 to 5.8GHz, Supply Voltage=3.3V**

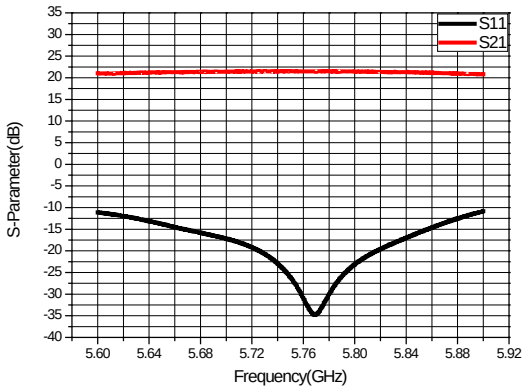
| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Compliance and Nominal Conditions | | | | | VCC1=VCC2=VCCB=3.3V, ICQ=300mA, $T_{OP}$=+25°C, Freq=5.2GHz to 5.8GHz |
| Frequency Range | 5.2 | 5.5 | 5.8 | GHz | |
| Output Power | | 25 | 25.5 | dBm | 5.5 GHz |
| Gain | | 21 | | dB | 5.5 GHz |
| EVM | | 2.6 | | % | @Pout=+23dBm, 5.5 GHz 802.16d, 64QAM |
| | | 2.3 | | % | @Pout=+18dBm, 5.5 GHz 802.11a, 54 Mbps, 64QAM |
| | | 2.4 | | % | @Pout=+17dBm, 5.5 GHz 802.11n, 81 Mbps, QPSK |
| **Power Supply** | | | | | |
| Reference Voltage, VREF | | 3.2 | | V | |
| Quiescent Current (Total), ICQ | | 300 | | mA | |

## Typical Performance Data

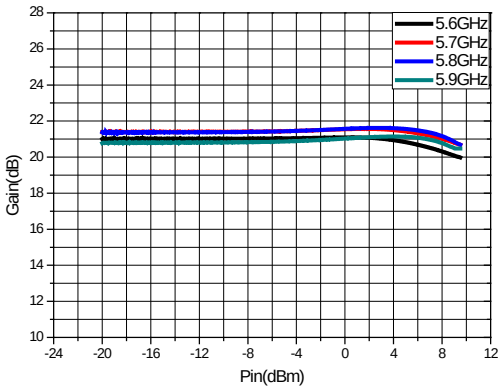
**Test Frequency: 5.6 to 5.9GHz**

**(Test Condition: VCC1=VCC2=VCCB=5.5V, ICQ=240mA, $T_{OP}$=+25°C)**

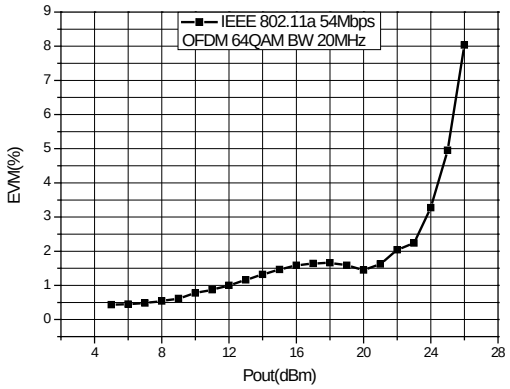
**Small Signal Parameters**




**Power Gain vs. Input Power**




**802.11a EVM vs. Output Power @5.8GHz**

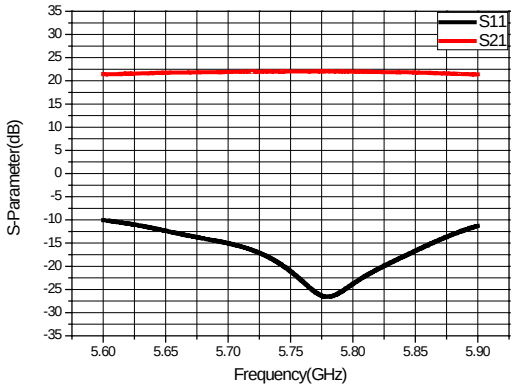


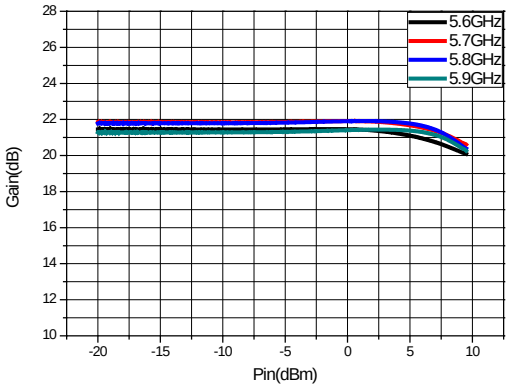
**Test Frequency: 5.6 to 5.9GHz**

**(Test Condition: VCC1=VCC2=VCCB=5V, ICQ=240mA, TOP=+25°C)**

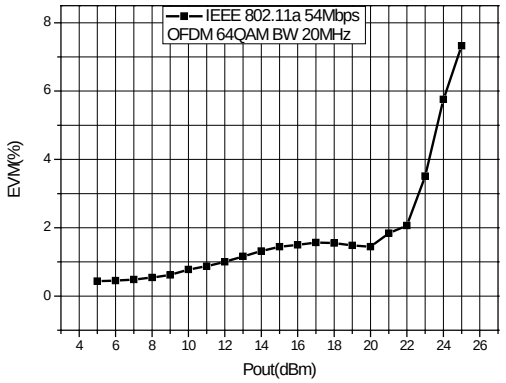
**Small Signal Parameters**




**Power Gain vs. Input Power**




**802.11a EVM vs. Output Power @5.8GHz**

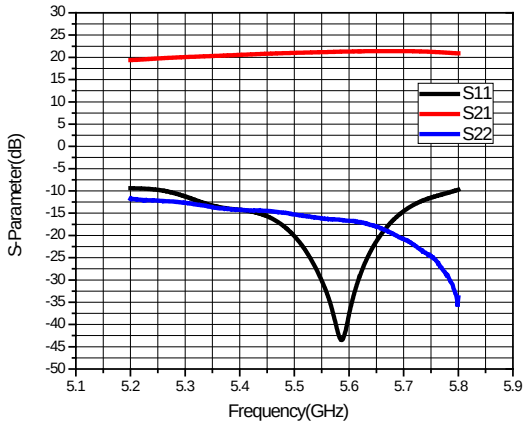


## Typical Performance Data

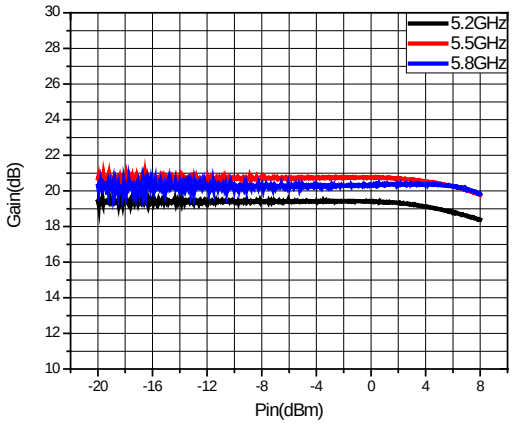
**Test Frequency: 5.2 GHz to 5.8GHz**

**(Test Condition: VCC1=VCC2=VCCB=5.0V, ICQ=300mA, $T_{OP}$=+25°C)**

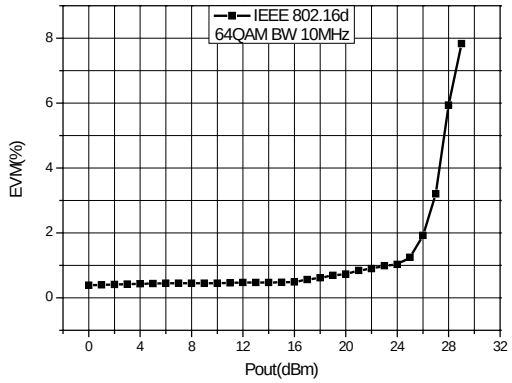
### Small Signal Parameters



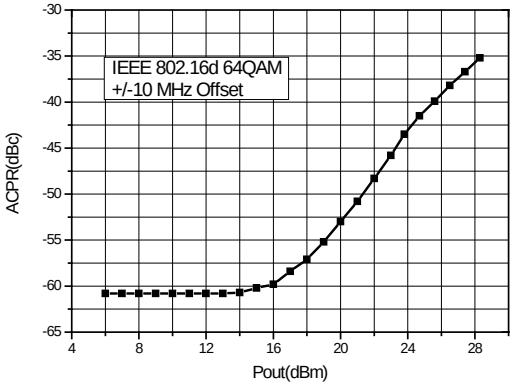

### Power Gain vs. Input Power



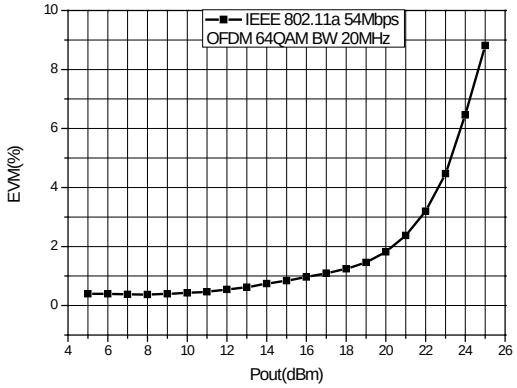

### 802.16d EVM vs. Output Power @5.5GHz



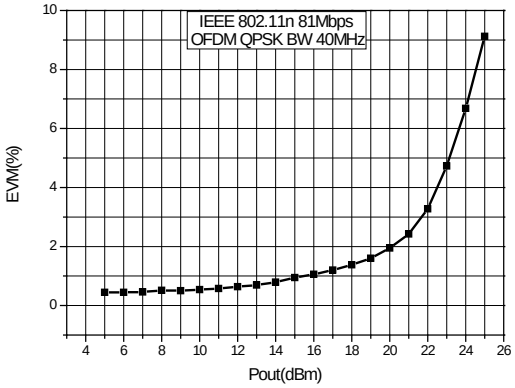

### 802.16d ACPR vs. Output Power @5.5GHz




### 802.11a EVM vs. Output Power @5.5GHz



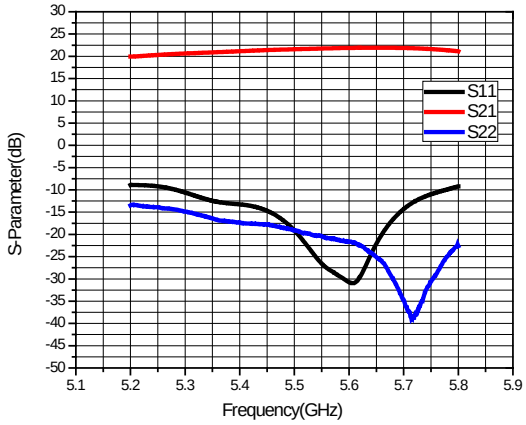

### 802.11n EVM vs. Output Power @5.5GHz



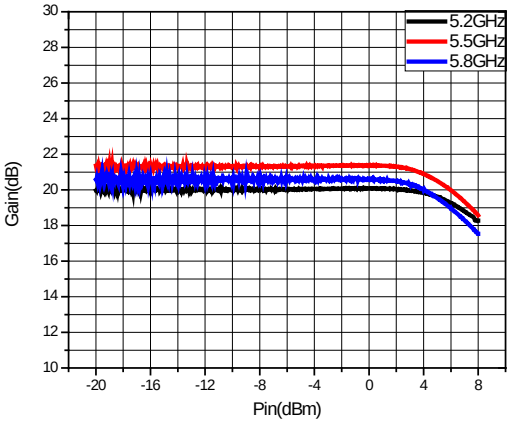
**Test Frequency: 5.2 GHz to 5.8GHz**

**(Test Condition: VCC1=VCC2=VCCB=3.3V, ICQ=300mA, $T_{OP}$=+25°C)**

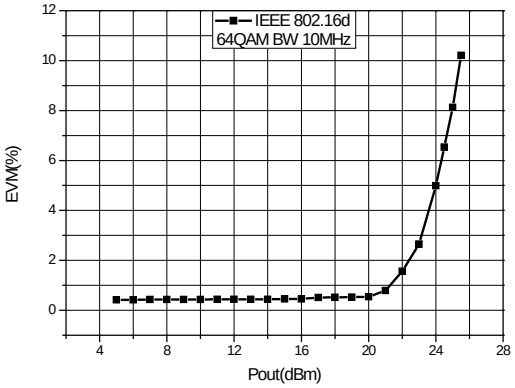
### Small Signal Parameters



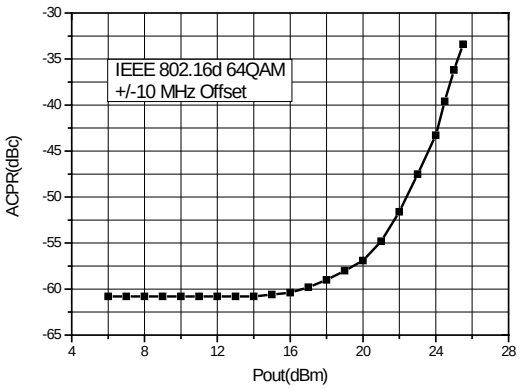

### Power Gain vs. Input Power



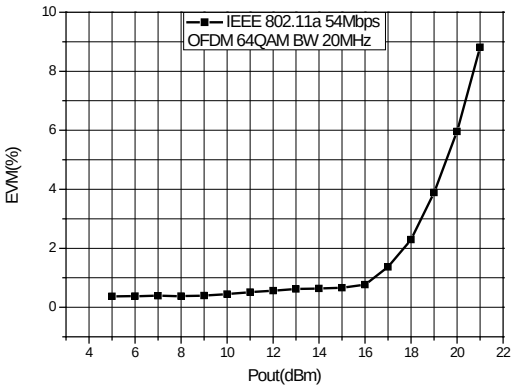

### 802.16d EVM vs. Output Power @5.5GHz



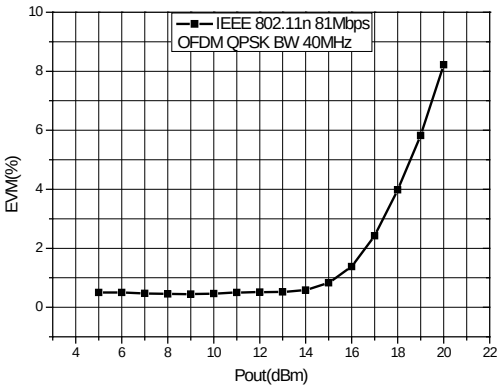

### 802.16d ACPR vs. Output Power @5.5GHz




### 802.11a EVM vs. Output Power @5.5GHz



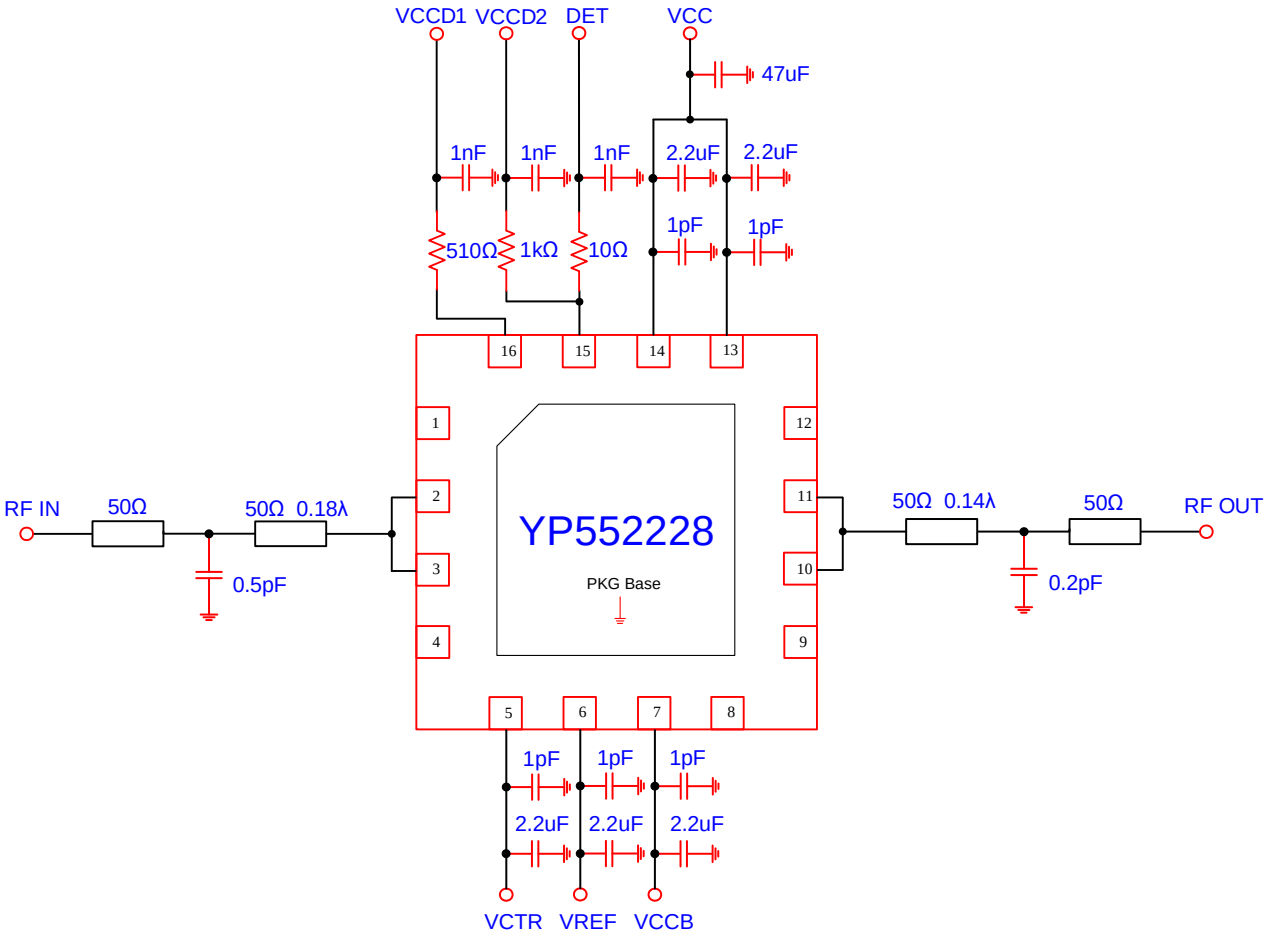

### 802.11n EVM vs. Output Power @5.5GHz



## Evaluation Board Schematic

**Test Frequency: 5.6 to 5.9GHz**

**(Supply & Reference Voltage Value refer to Table 1-1 &1-2 )**

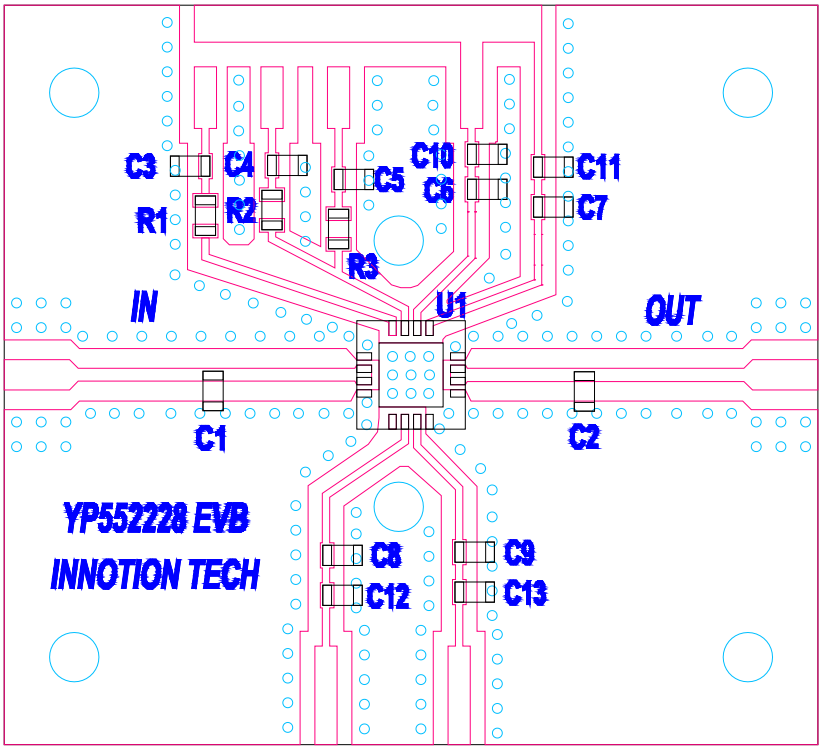



Notes:

1. Pin5 is power down pin. Apply >2.5 $V_{DC}$ to power down the three power amplifier stages. Apply 0$V_{DC}$ to power up. If function is not desired, pin5 may be connected to GND.
2. Pin15, 16 are active power detection circuit ports, if function is not desired, pin16, 16 may be connected to GND.

## Evaluation Board Layout

**Test Frequency: 5.6 to 5.9GHz**
**Board Size: 33mm×30mm**
**Board Thickness: 0.4 mm, Board Material: FR-4 ($\varepsilon_r$=4.5)**



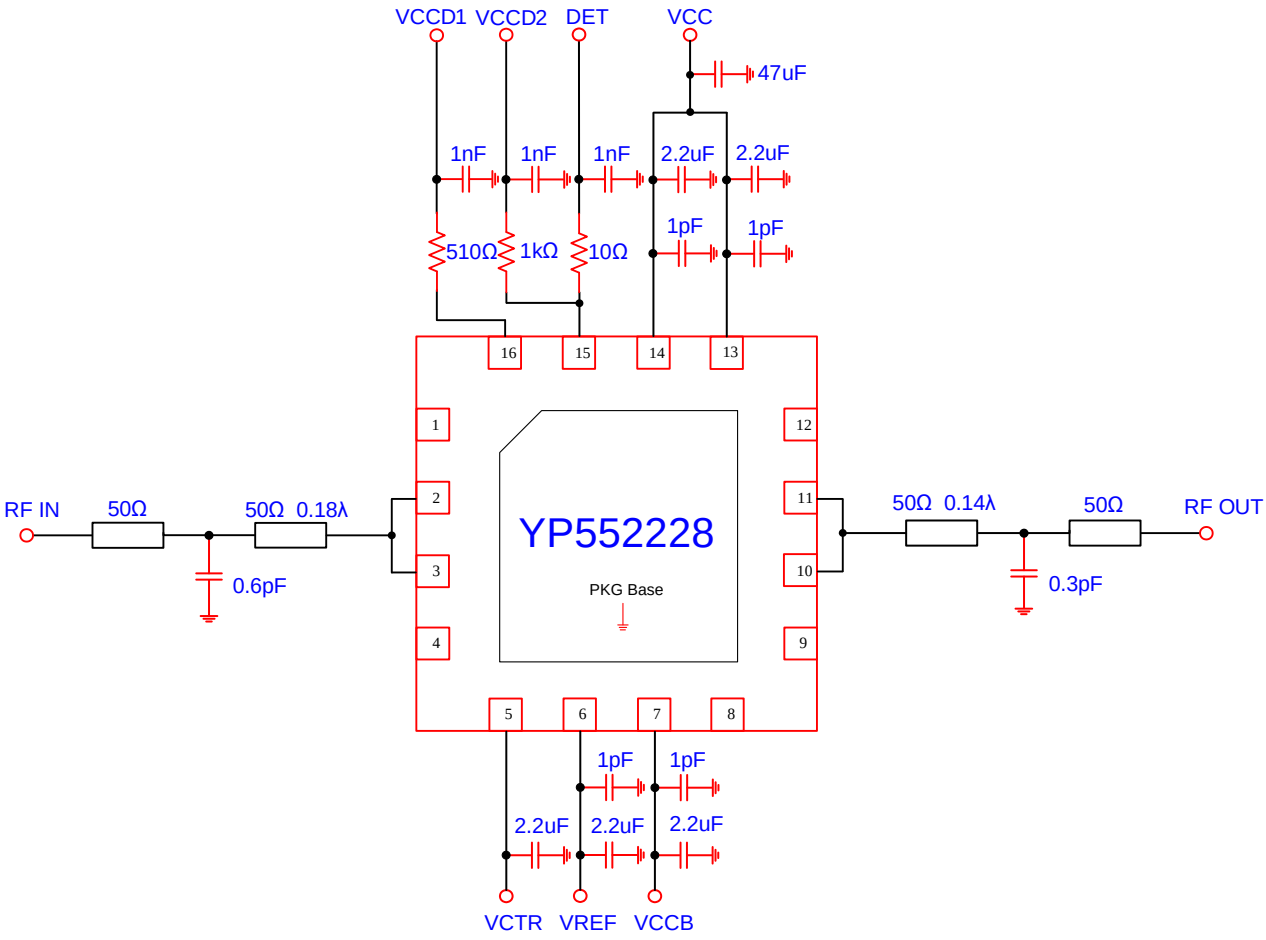

■ **Table 3: Circuit Component Designations and Values**

| Component | Description | Manufacturer |
|---|---|---|
| C1 | 0.5pF Chip Capacitor | ATC |
| C2 | 0.2pF Chip Capacitor | ATC |
| C3,C4,C5 | 1nF Chip Capacitor | TDK |
| C6,C7,C8,C9 | 1pF Chip Capacitor | TDK |
| C10,C11,C12,C13 | 2.2uF Chip Capacitor | TDK |
| R1 | 510Ω Chip Resistor | YAGEO |
| R2 | 1kΩ Chip Resistor | YAGEO |
| R3 | 10Ω Chip Resistor | YAGEO |
| U1 | YP552228 | INNOTION |

## Evaluation Board Schematic

**Test Frequency: 5.2 to 5.8GHz**
**(Supply & Reference Voltage Value refer to Table 2-1 &2-2)**

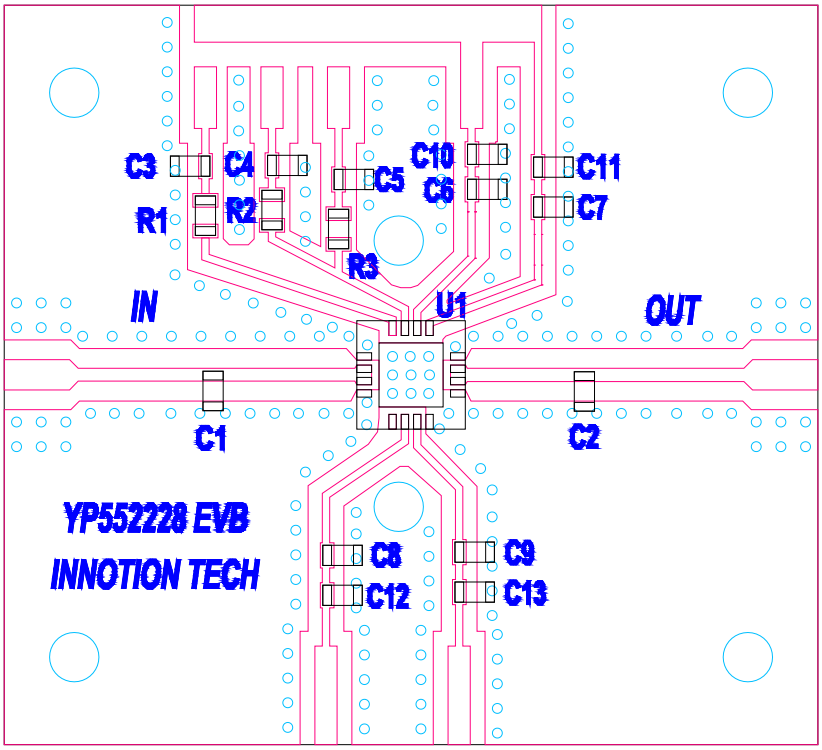



Notes:

1. Pin5 is power down pin. Apply >2.5 $V_{DC}$ to power down the three power amplifier stages. Apply 0$V_{DC}$ to power up. If function is not desired, pin5 may be connected to GND.
2. Pin15, 16 are active power detection circuit ports, if function is not desired, pin16, 16 may be connected to GND.

## Evaluation Board Layout

**Test Frequency: 5.2 to 5.8GHz**
**Board Size: 33mm×30mm**
**Board Thickness: 0.4mm, Board Material: FR-4 ($\varepsilon_r$=4.5)**

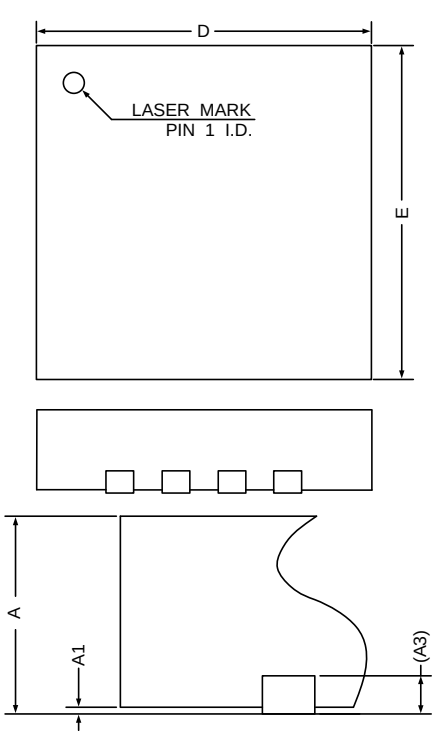


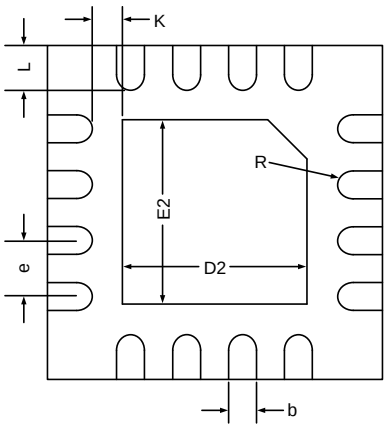

■ **Table 4: Circuit Component Designations and Values**

| Component | Description | Manufacturer |
|---|---|---|
| C1 | 0.6pF Chip Capacitor | ATC |
| C2 | 0.3pF Chip Capacitor | ATC |
| C3,C4,C5 | 1nF Chip Capacitor | TDK |
| C6,C7,C8,C9 | 1pF Chip Capacitor | TDK |
| C10,C11,C12,C13 | 2.2uF Chip Capacitor | TDK |
| R1 | 510Ω Chip Resistor | YAGEO |
| R2 | 1kΩ Chip Resistor | YAGEO |
| R3 | 10Ω Chip Resistor | YAGEO |
| U1 | YP552228 | INNOTION |

## Packaging Diagram



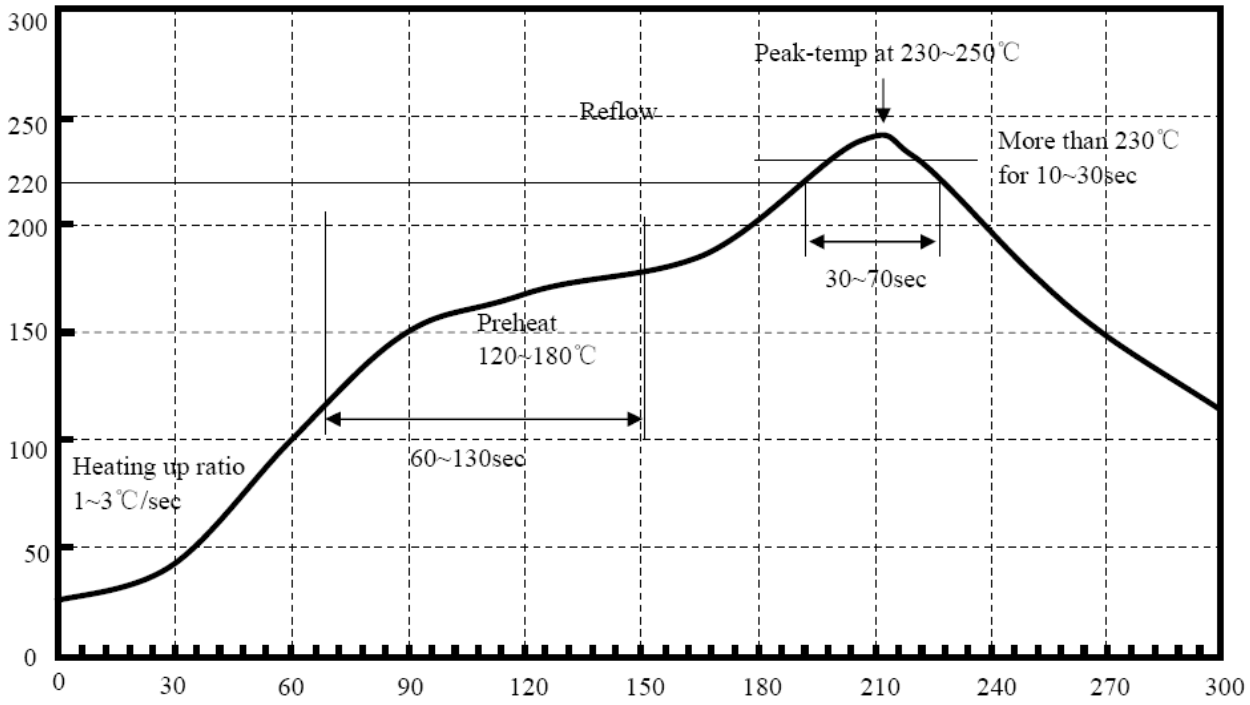




COMMON DIMENSIONS
(UNITS OF MEASURE = MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0 | 0.02 | 0.05 |
| A3 | | 0.203 REF | |
| b | 0.25 | 0.30 | 0.35 |
| D | 3.95 | 4.00 | 4.05 |
| E | 3.95 | 4.00 | 4.05 |
| D2 | 2.00 | 2.15 | 2.25 |
| E2 | 2.00 | 2.15 | 2.25 |
| e | 0.60 | 0.65 | 0.70 |
| K | 0.375 | — | — |
| L | 0.35 | 0.40 | 0.45 |
| R | 0.09 | — | — |

NOTE:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO-220 WEED-4.

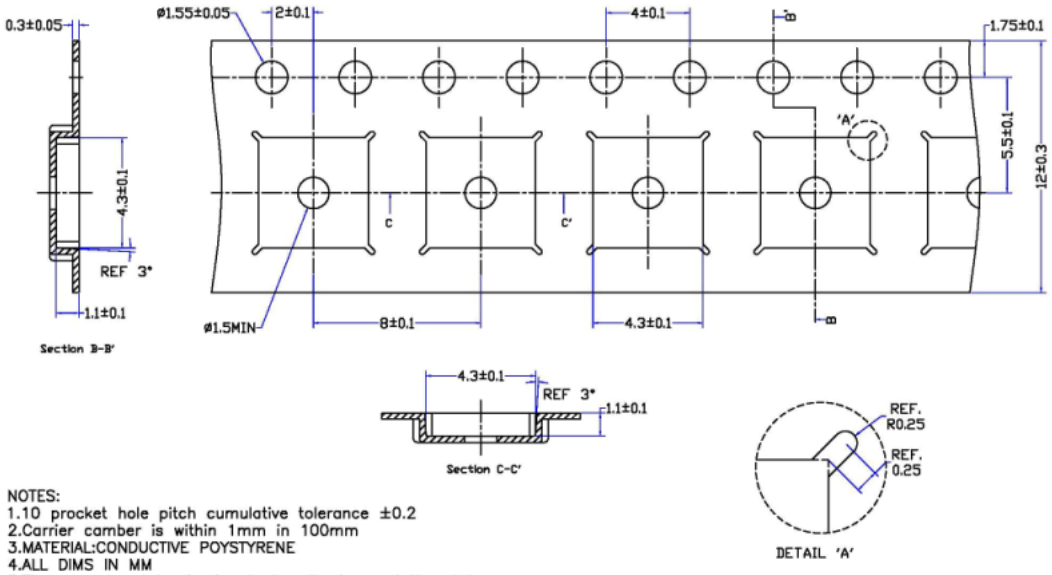
## Recommended Solder Temperature




**Recommended Temperature**

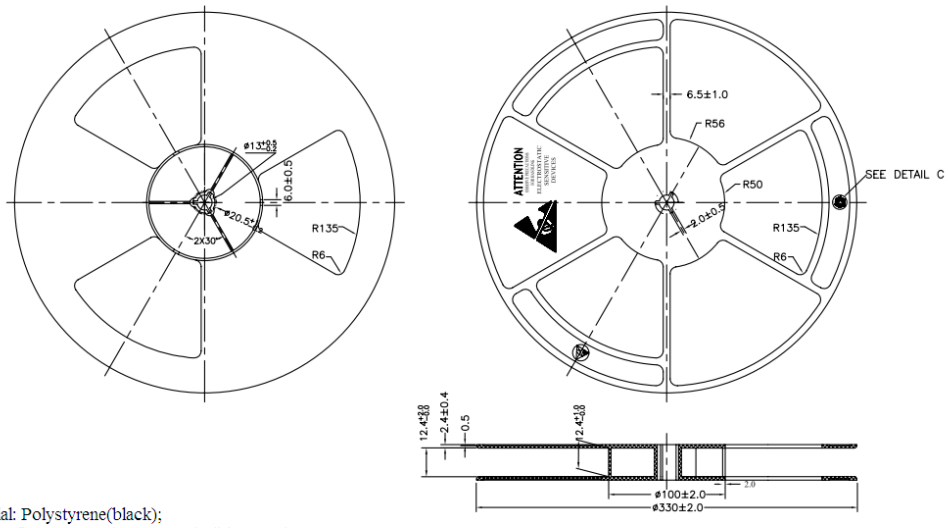
**Sn95.5Ag4.0Cu0.5**

## Tape dimensions and Orientation




NOTES:
1.10 procket hole pitch cumulative tolerance ±0.2
2.Carrier camber is within 1mm in 100mm
3.MATERIAL:CONDUCTIVE POYSTYRENE
4.ALL DIMS IN MM
5.There must not be foreign body adhesion and the state of the surface must be excellent
6.17" PAPER—Reel, 51875pockets
7.Surface resistance 1X10E11(max) OHMS/SQ

## Reel dimensions and Orientation




**Notes:**
1. Material: Polystyrene(black);
2. Surface flatness: Maximum permissible error is 3mm;
3. Dimensions in millimeters;
4. Surface resistance: 105TO 1010/OHMS/SQ;
5. General tolerances: ±0.25