

### Features

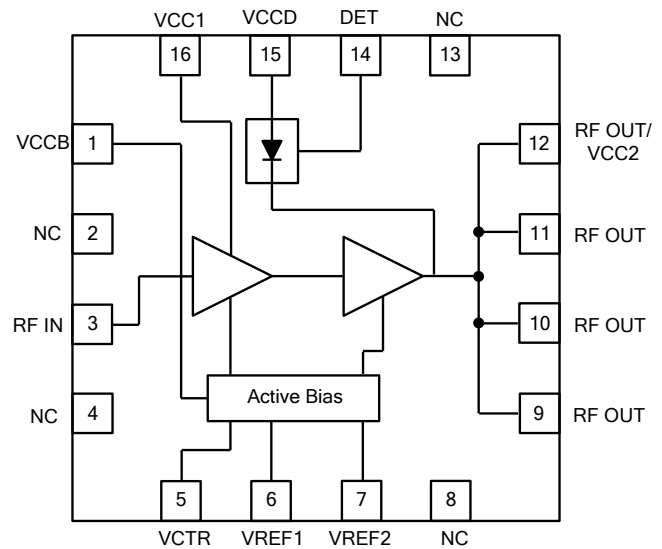
- 700~2700MHz Operating Range
- 3.3~5.0V Supply Voltage
- 26dB Gain (Typ.) @1.6GHz
- 34dBm P1dB @ Supply Voltage =5V
- 280mA Quiescent Current
- >15dB Input Return Loss
- Integrated Output Power Detector
- ESD protection all ports above 1000V HBM

### Product Description

The YP2233W is a high dynamic range broadband power amplifier in a surface mount package. The two-stage amplifier provides a typical gain of 26dB, while being able to achieve high performance for 0.7–2.7 GHz applications (It needs different matching circuit for different freq range) with up to +34dBm of compressed 1dB power, typical bias condition is 5V at 280mA.

The device is manufactured on an advanced InGaP Heterojunction Bipolar Transistor (HBT) process. The device incorporates proprietary bias circuitry to compensate for variations in linearity and current draw over temperature.

The YP2233W is assembled in a 16-pin, 4mm×4mm, QFN package. It is internally integrated with ESD protection circuitry on all ports.



Functional Block Diagram

### Applications

- 802.11b/g/n Access Point
- 2.4GHz ISM Wireless Equipment
- PCS Communication Systems
- Broadband Spread-Spectrum Systems
- High Power Amplifiers Application
- Final Stage Amplifiers for repeaters
- BD Compass
- LoRa

### Ordering Information

- |                 |                             |
|-----------------|-----------------------------|
| ■ YP2233W       | BroadBand Power Amplifier   |
| ■ YP2233W EVB-1 | 1.2-1.3GHz Evaluation Board |
| ■ YP2233W EVB-2 | 1.5-1.7GHz Evaluation Board |
| ■ YP2233W EVB-3 | 2.4-2.5GHz Evaluation Board |
| ■ YP2233W EVB-4 | 868-915MHz Evaluation Board |

## Pin Description

Pin No.	Symbol	Description
1	VCCB	Supply voltage for bias
3	RF IN	RF input
5	VCTR	Power on/off control voltage. Apply >2.5VDC to power down the three power amplifier stages. Apply 0VDC to power up. If function is not desired, pin5 may be connected to GND.
6, 7	VREF1, VREF2	Bias current control voltage for stage1, stage2
9, 10, 11, 12	RF OUT/VCC2	RF output and supply voltage for stage2
14	DET	Output power detect
15	VCCD	Supply voltage for power detector
16	VCC1	Supply voltage for Stage1
2, 4, 8, 13	NC/GND	No connection or ground
PKG Base	GND	Ground connection

## Absolute Maximum Ratings



**Caution! ESD Sensitive Device.**

Parameter	Symbol	Rating	Unit
Input RF Power	RF IN	+10	dBm
Supply Voltage	VCC1,VCC2, VCCB,VCCD	-0.5 to +8.0	V
Reference Voltage	VREF1, VREF2	-0.5 to +3.0	V
Operating Ambient Temperature	T <sub>OP</sub>	-40 to +85	°C
Storage Temperature	T <sub>ST</sub>	-40 to +150	°C

**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

(VCC1=VCC2 =VCCB=5.0V, T<sub>OP</sub>=+25°C as measured on the evaluation board, unless otherwise noted)

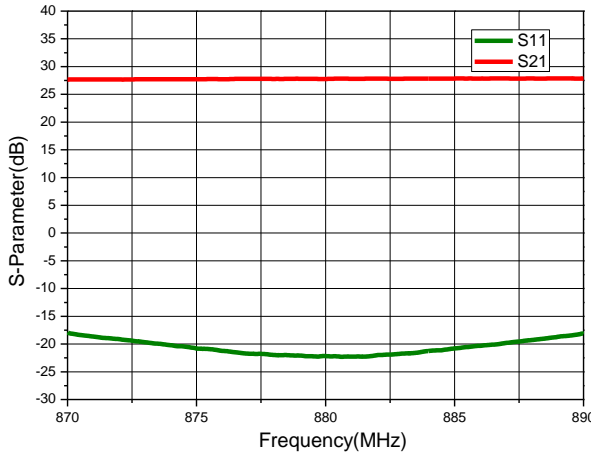
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency Range	1.2	1.25	1.3	GHz	
Output Power@1dB Compression	33.5	34	34.5	dBm	@1.25GHz
Gain,  S <sub>21</sub>	26.5	27	27.5	dB	@1.25GHz
<b>Power Supply</b>					
Reference Voltage 1, VREF1		2.65		V	
Reference Voltage 2, VREF2		2.65		V	
Quiescent Current (Total), ICQ		240		mA	VREF1=VREF2=2.65V
Reference Current (Total), IREF		5		mA	Total Current of VREF1+VREF2

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency Range	1.6	1.63	1.65	GHz	
Output Power@1dB Compression	34	34.5	34.7	dBm	@1.63GHz
Gain,  S <sub>21</sub>	25.5	26	26.5	dB	@1.63GHz
<b>Power Supply</b>					
Reference Voltage 1, VREF1		2.68		V	
Reference Voltage 2, VREF2		2.68		V	
Quiescent Current (Total), ICQ		280		mA	VREF1=VREF2=2.68V

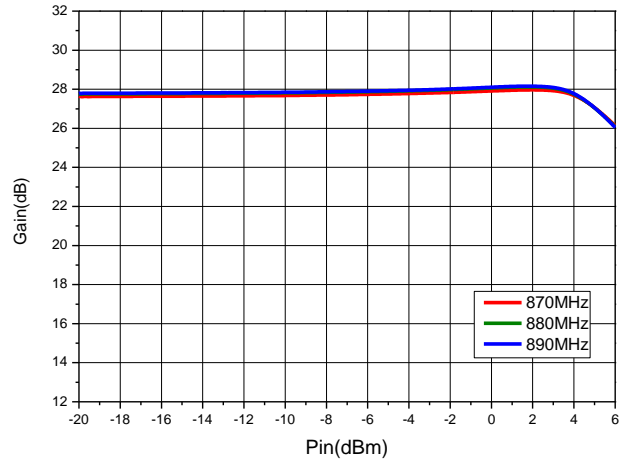
## Typical Performance

(Frequency range: 870MHz~890MHz)

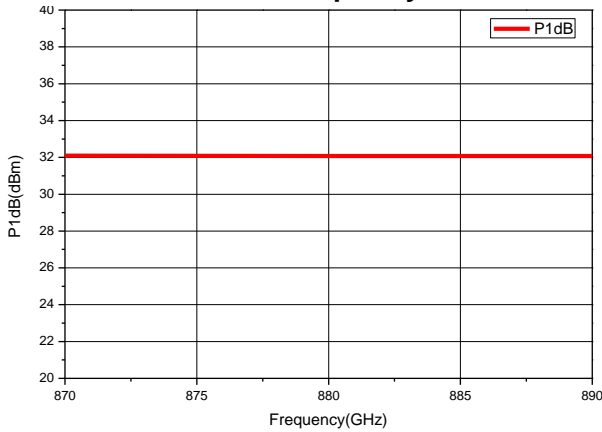
**Narrowband Gain & Return Loss**



**Power Gain vs. Input Power**



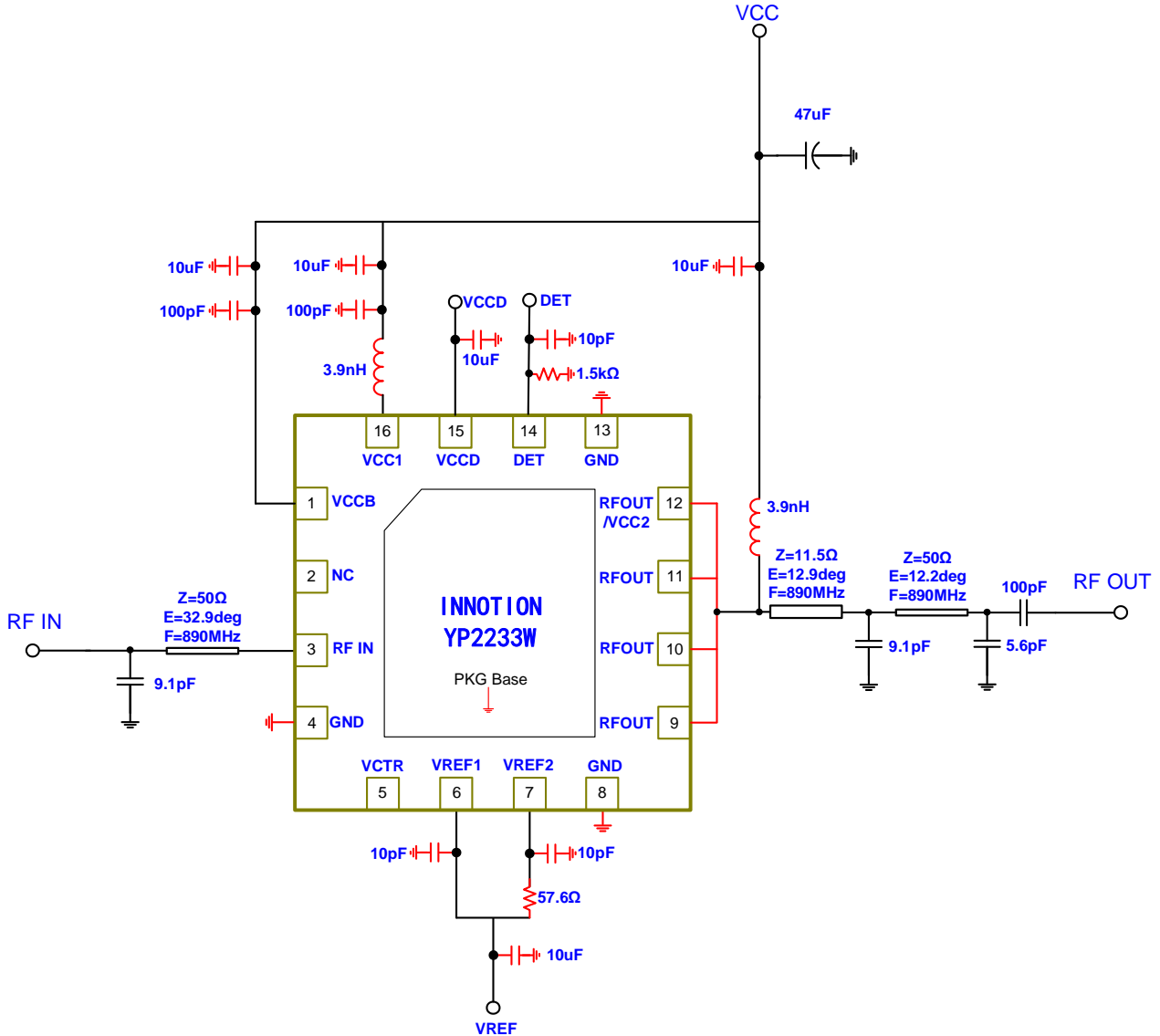
**P1dB vs. Frequency**



### Application Schematic

(Frequency range: 870MHz~890MHz)

(Test Condition:  $VCC1=VCC2=5.0V$ ,  $VREF1=VREF2=2.78V$ ,  $ICQ=340mA$ ,  $T_{OP}=+25^{\circ}C$ )



**Notes:**

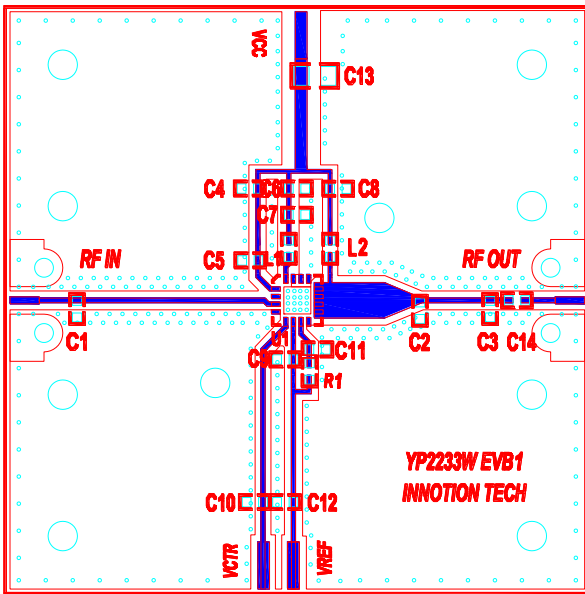
1. Pin5 is power down pin. Apply  $>2.5 V_{DC}$  to power down the three power amplifier stages. Apply  $0V_{DC}$  to power up. If function is not desired, pin5 may be connected to GND.
2. Pin14, 15 are active power detection circuit ports, if function is not desired, pin14, 15 may be connected to GND.

## Evaluation Board Layout

(Frequency range: 870MHz~890MHz)

Board Size 50mm×50mm, Board Thickness 1mm, Board Material FR-4 ( $\epsilon_r=4.5$ )

### Evaluation Board Top View



### Layer Detail Physical Characteristics

Cross Section	Name	Thickness	Material	$\epsilon_r$
Via14	RFS	1 oz	Cu	--
	Core 1	0.23 mm	FR-4	4.5
	RFGND	1 oz	Cu	--
			FR-4	4.5
	PCS	1 oz	Cu	--
			FR-4	4.5
	GND	1oz	Cu	--

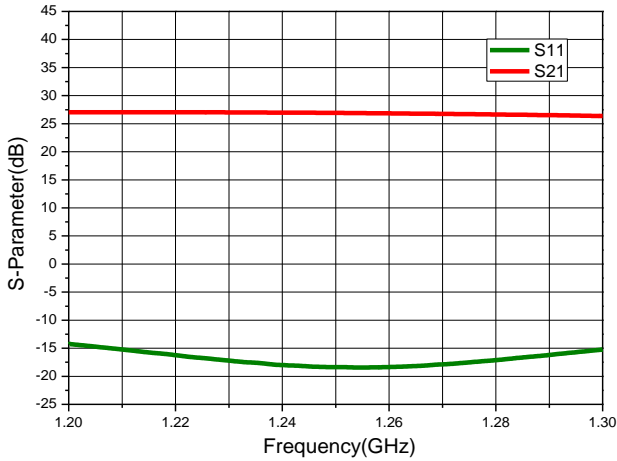
### Circuit Component Designations and Values

Component	Description	Manufacturer
L1, L2	3.9nH Inductor	ATC
C1, C2	9.1pF Chip Capacitor	DLC
C3	5.6pF Chip Capacitor	DLC
C5, C7, C9, C11, C14	100pF Chip Capacitor	TDK
C4, C6, C8, C10, C12	10uF Chip Capacitor	TDK
C13	47uF Capacitor	AVX
R1	57.6ohm	TDK

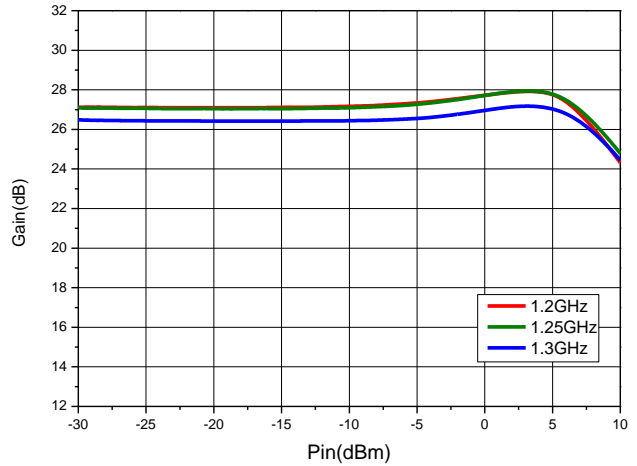
## Typical Performance

(Frequency range: 1.2GHz~1.3GHz)

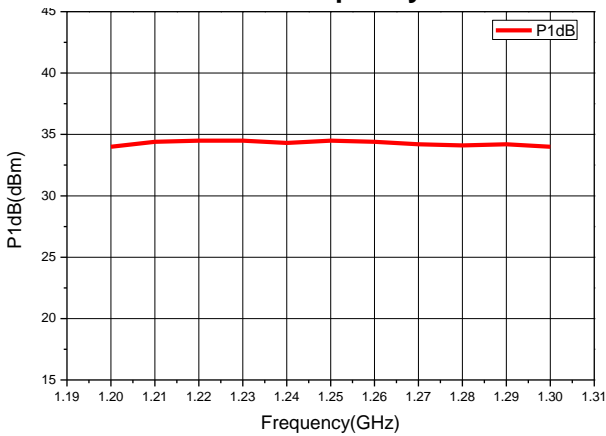
**Narrowband Gain & Return Loss**



**Power Gain vs. Input Power**



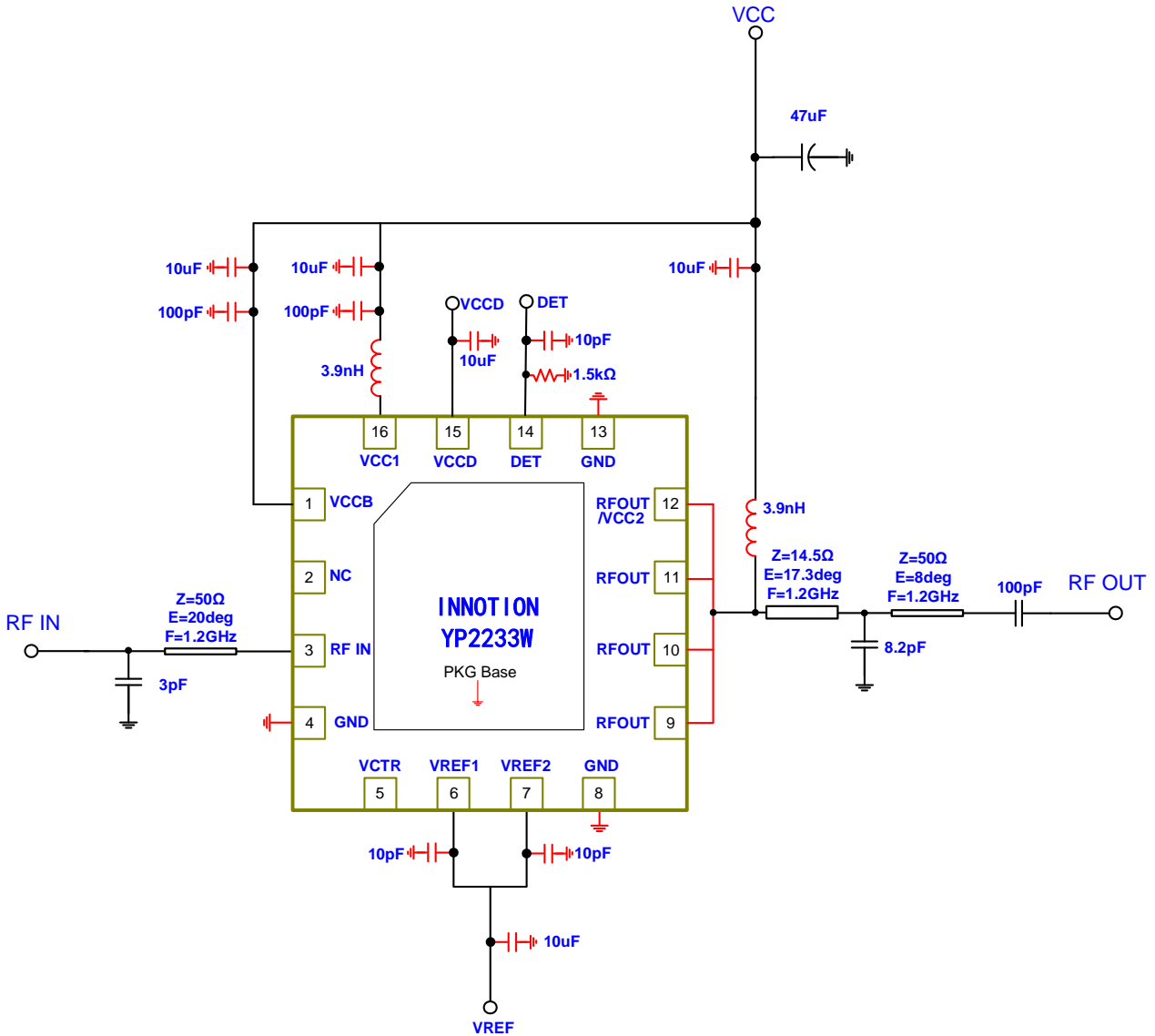
**P1dB vs. Frequency**



## Application Schematic

(Frequency range: 1.2GHz~1.3GHz)

(Test Condition:  $VCC1=VCC2=5.0V$ ,  $VREF1=VREF2=2.65V$ ,  $ICQ=240mA$ ,  $T_{OP}=+25^{\circ}C$ )



**Notes:**

1. Pin5 is power down pin. Apply  $>2.5 V_{DC}$  to power down the three power amplifier stages. Apply  $0V_{DC}$  to power up. If function is not desired, pin5 may be connected to GND.
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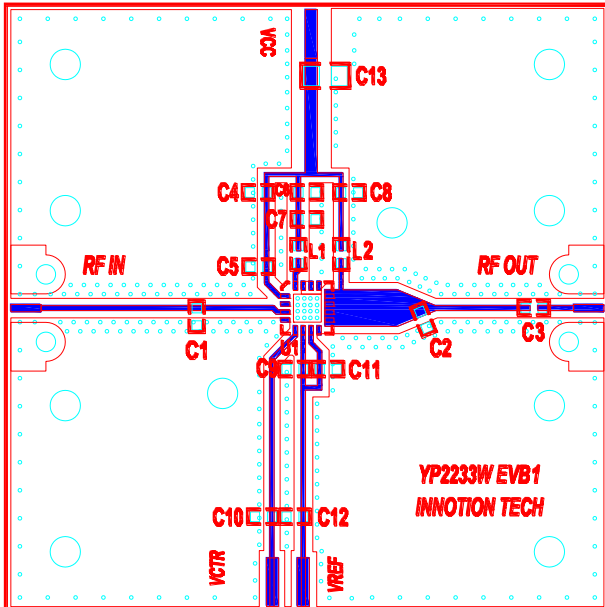


## Evaluation Board Layout

(Frequency range: 1.2GHz~1.3GHz)

Board Size 50mm×50mm, Board Thickness 1mm, Board Material FR-4 ( $\epsilon_r=4.5$ )

### Evaluation Board Top View



### Layer Detail Physical Characteristics

Cross Section	Name	Thickness	Material	$\epsilon_r$
Via14	RFS	1 oz	Cu	--
	Core 1	0.23 mm	FR-4	4.5
	RFGND	1 oz	Cu	--
			FR-4	4.5
	PCS	1 oz	Cu	--
			FR-4	4.5
	GND	1oz	Cu	

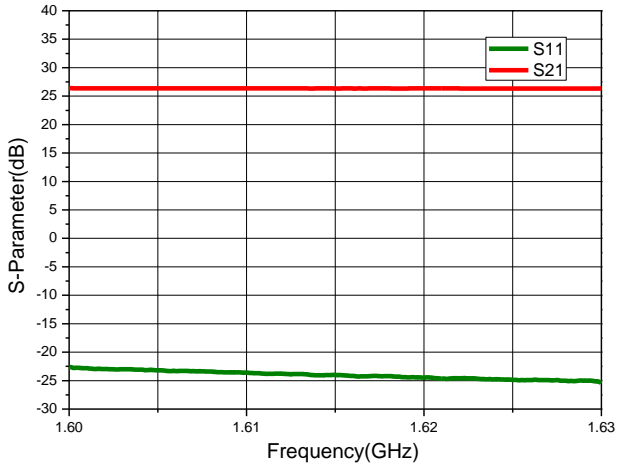
### Circuit Component Designations and Values

Component	Description	Manufacturer
L1, L2	3.9nH Inductor	ATC
C1	3pF Chip Capacitor	DLC
C2	8.2pF Chip Capacitor	DLC
C3, C5, C7, C9, C11	100pF Chip Capacitor	TDK
C4, C6, C8, C10, C12	10uF Chip Capacitor	TDK
C13	47uF Capacitor	AVX

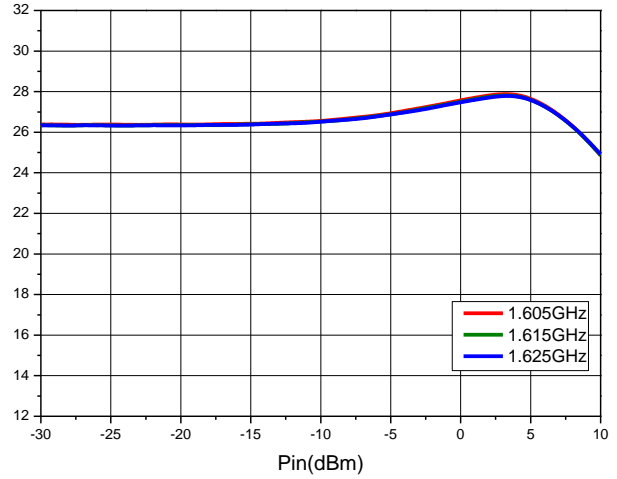
## Typical Performance

(Frequency range: 1.6GHz~1.63GHz)

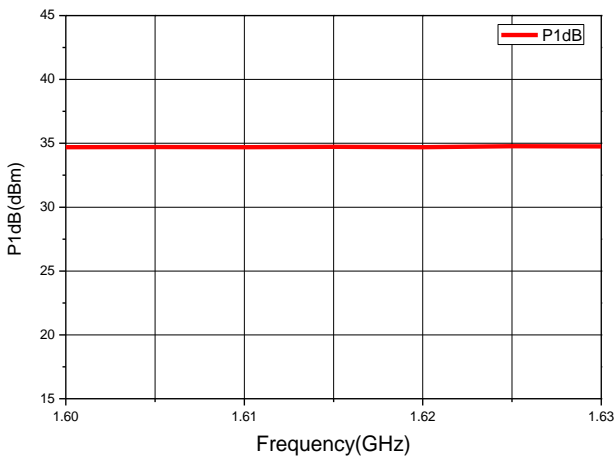
**Narrowband Gain & Return Loss**



**Power Gain vs. Input Power**



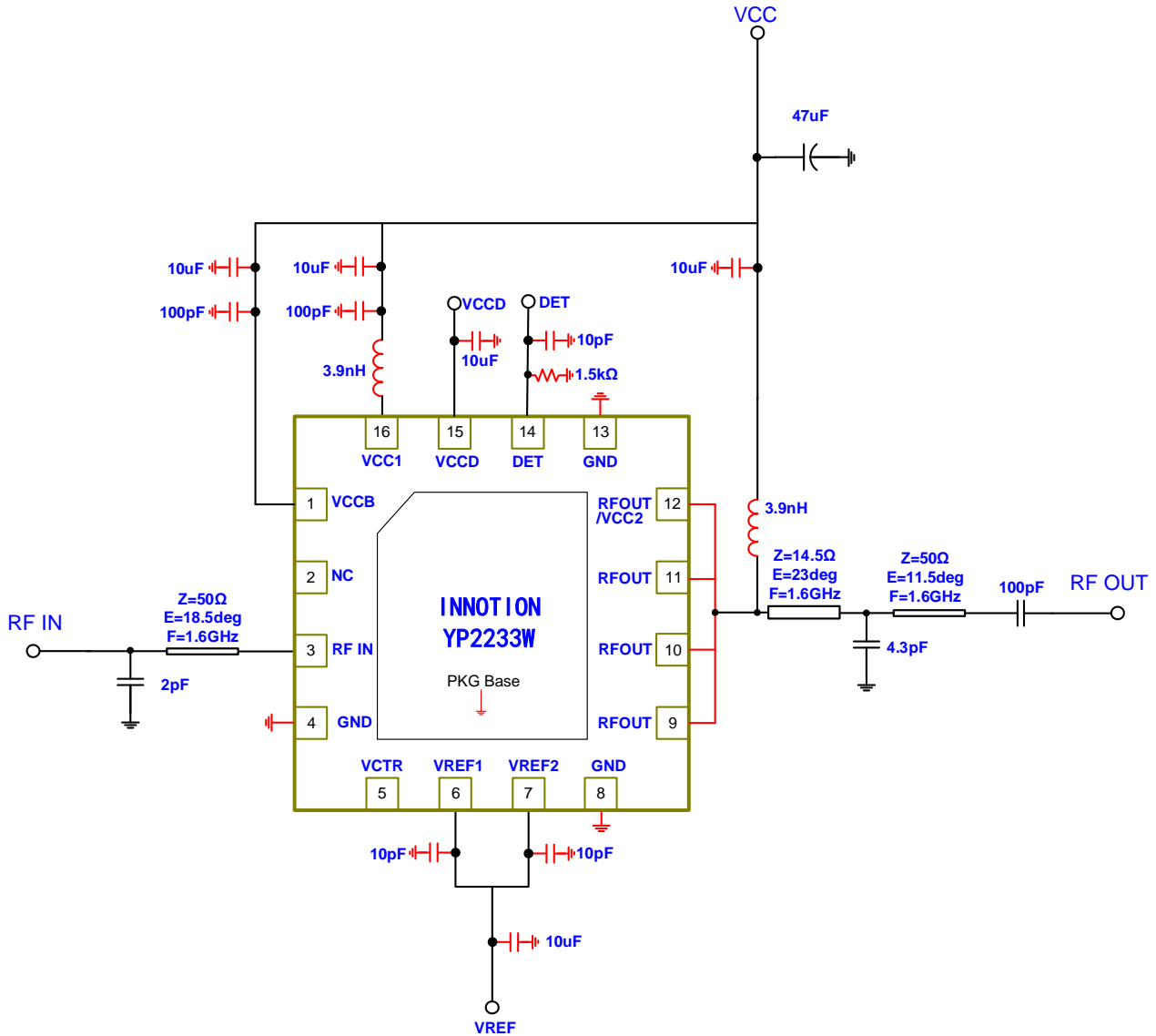
**P1dB vs. Frequency**



## Application Schematic

(Frequency range: 1.6GHz~1.63GHz)

(Test Condition:  $VCC1=VCC2=5.0V$ ,  $VREF1=VREF2=2.68V$ ,  $ICQ=280mA$ ,  $T_{OP}=+25^{\circ}C$ )



### Notes:

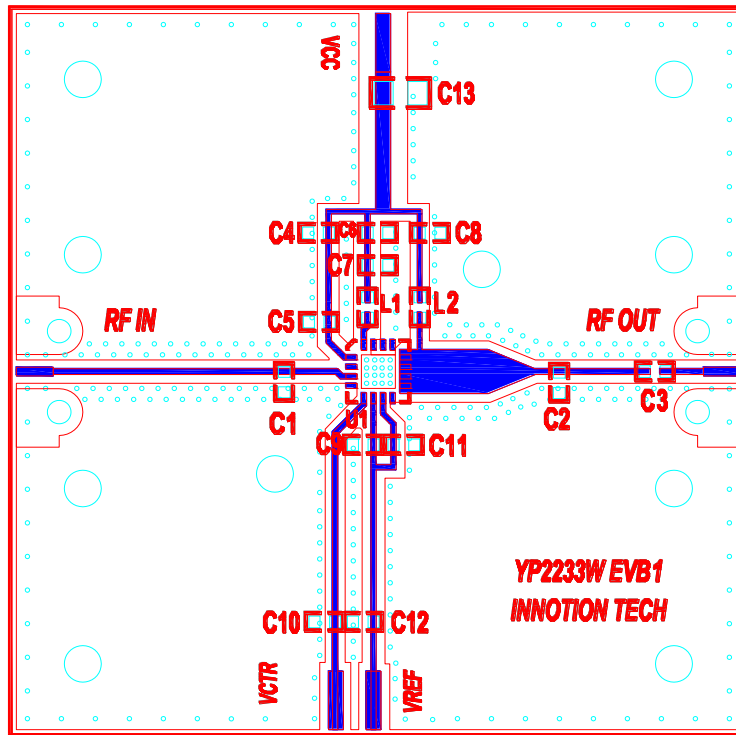
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2. Pin14, 15 are active power detection circuit ports, if function is not desired, pin14, 15 may be connected to GND.

## Evaluation Board Layout

(Frequency range: 1.6GHz~1.63GHz)

Board Size 50mm×50mm, Board Thickness 1mm, Board Material FR-4 ( $\epsilon_r=4.5$ )

Evaluation Board Top View



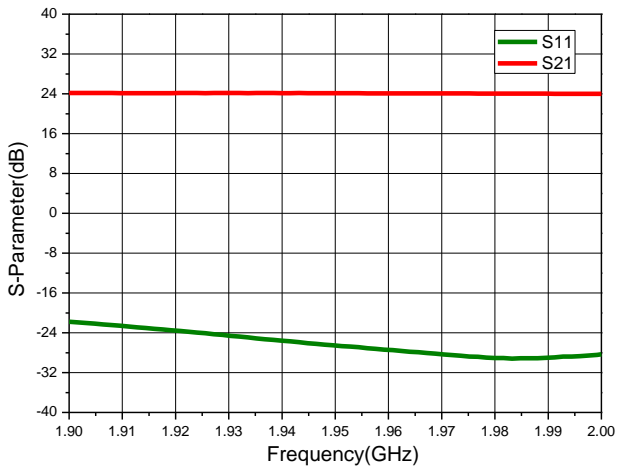
### Circuit Component Designations and Values

Component	Description	Manufacturer
L1, L2	3.9nH Inductor	ATC
C1	2pF Chip Capacitor	DLC
C2	4.3pF Chip Capacitor	DLC
C3, C5, C7, C9, C11	100pF Chip Capacitor	TDK
C4, C6, C8, C10, C12	10uF Chip Capacitor	TDK
C13	47uF Capacitor	AVX

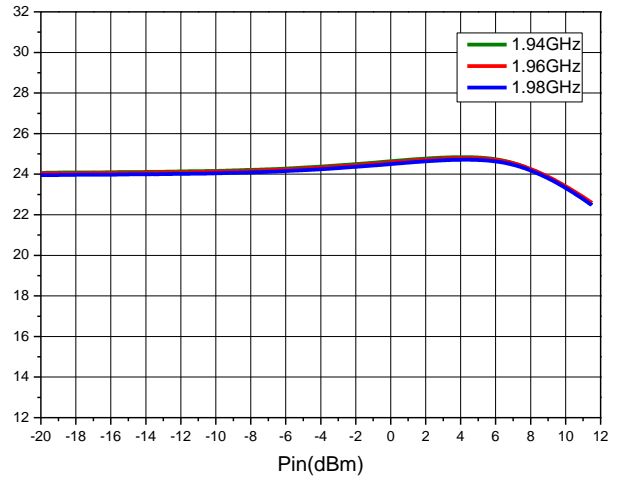
## Typical Performance

(Frequency range: 1.9GHz~2.0GHz)

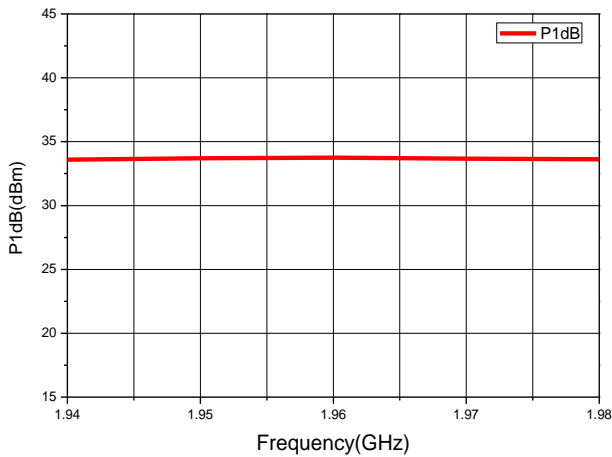
**Narrowband Gain & Return Loss**



**Power Gain vs. Input Power**



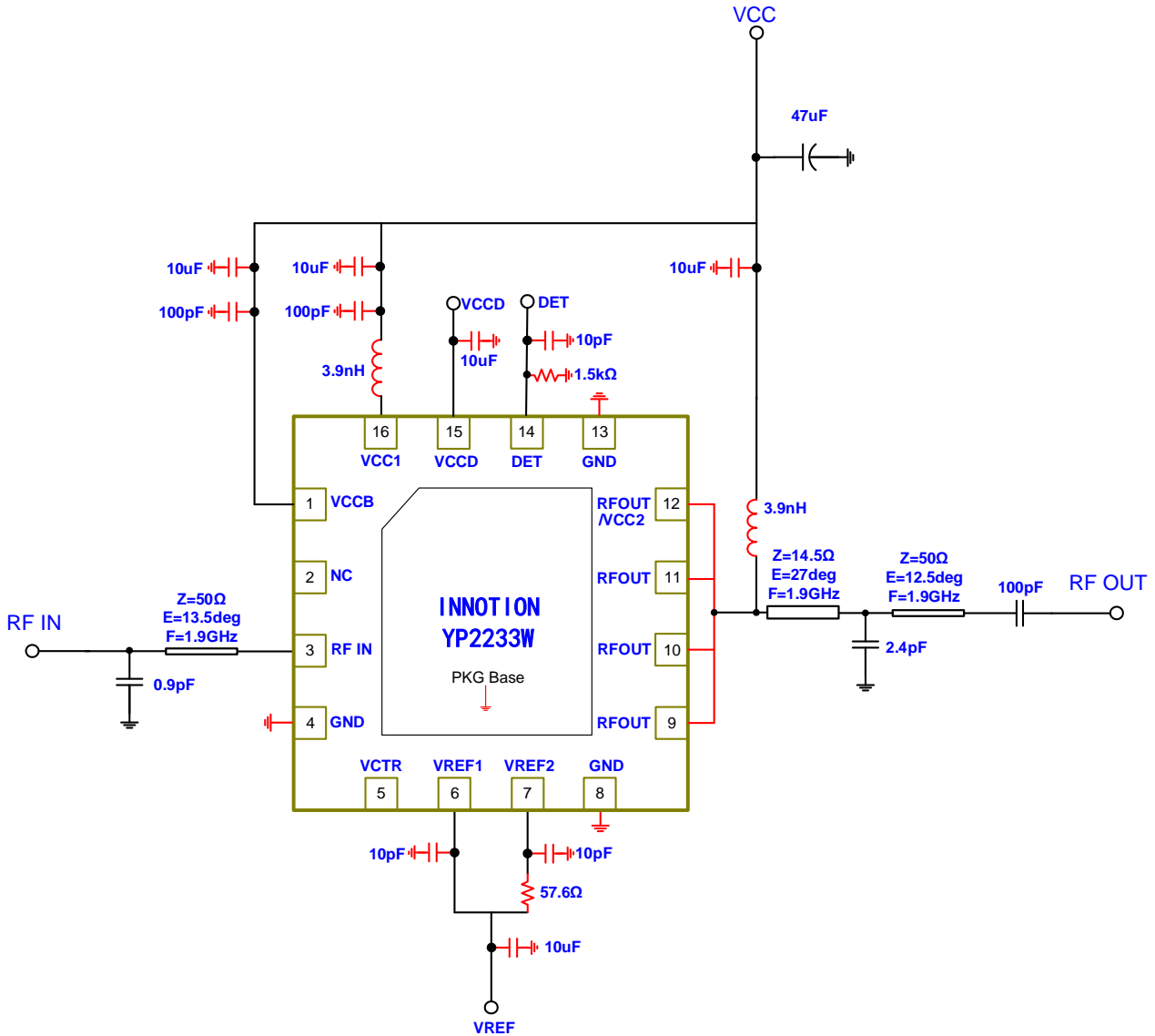
**P1dB vs. Frequency**



## Application Schematic

(Frequency range: 1.9GHz~2.0GHz)

(Test Condition:  $VCC1=VCC2=5.0V$ ,  $VREF1=VREF2=2.78V$ ,  $ICQ=340mA$ ,  $T_{OP}=+25^{\circ}C$ )



### Notes:

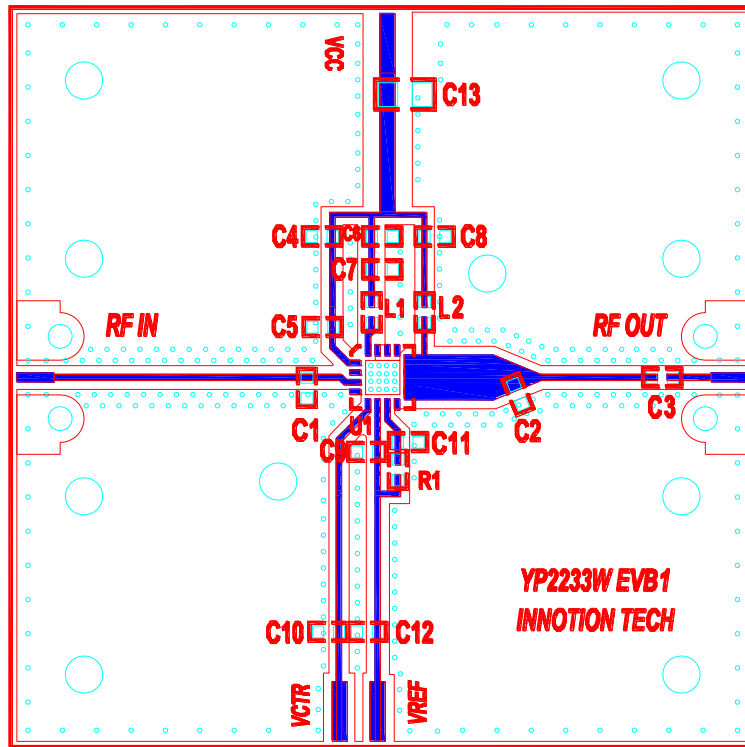
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### Evaluation Board Layout

(Frequency range: 1.9GHz~2.0GHz)

Board Size 50mm×50mm, Board Thickness 1mm, Board Material FR-4 ( $\epsilon_r=4.5$ )

Evaluation Board Top View



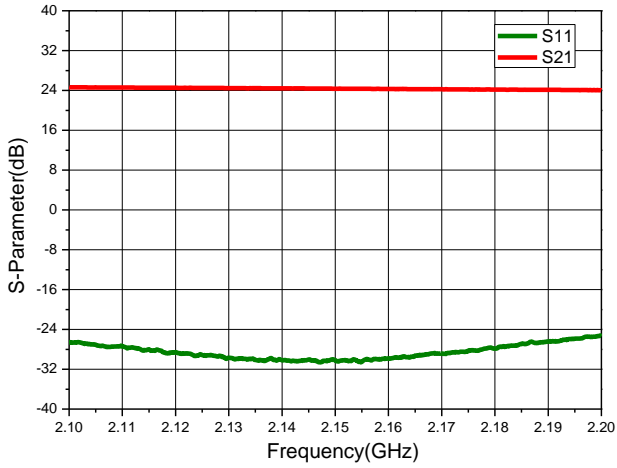
### Circuit Component Designations and Values

Component	Description	Manufacturer
L1, L2	3.9nH Inductor	ATC
C1	0.9pF Chip Capacitor	DLC
C2	2.4pF Chip Capacitor	DLC
C3, C5, C7, C9, C11	100pF Chip Capacitor	TDK
C4, C6, C8, C10, C12	10uF Chip Capacitor	TDK
C13	47uF Capacitor	AVX
R1	57.6ohm	TDK

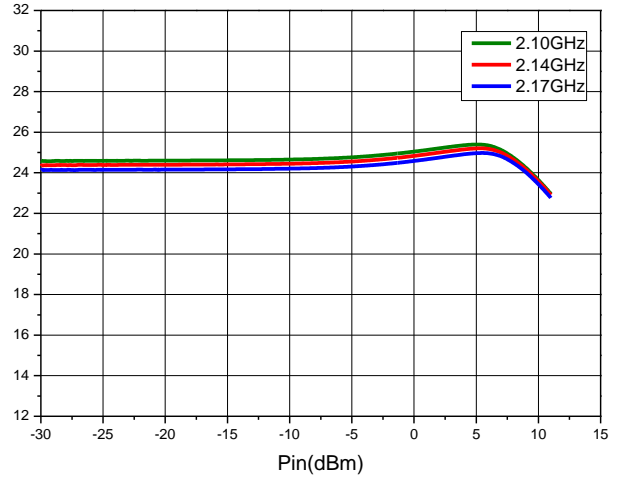
## Typical Performance

(Frequency range: 2.1GHz~2.2GHz)

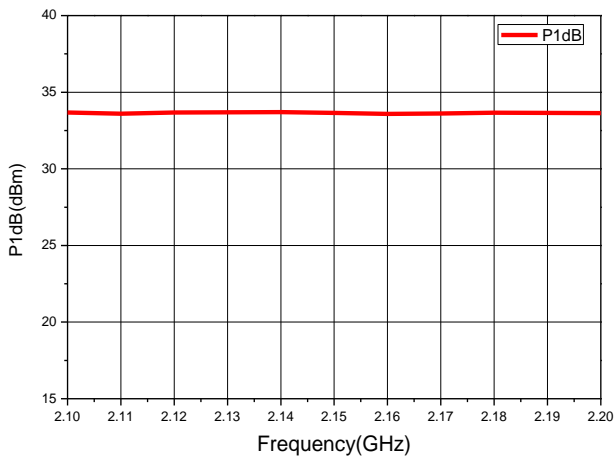
**Narrowband Gain & Return Loss**



**Power Gain vs. Input Power**



**P1dB vs. Frequency**

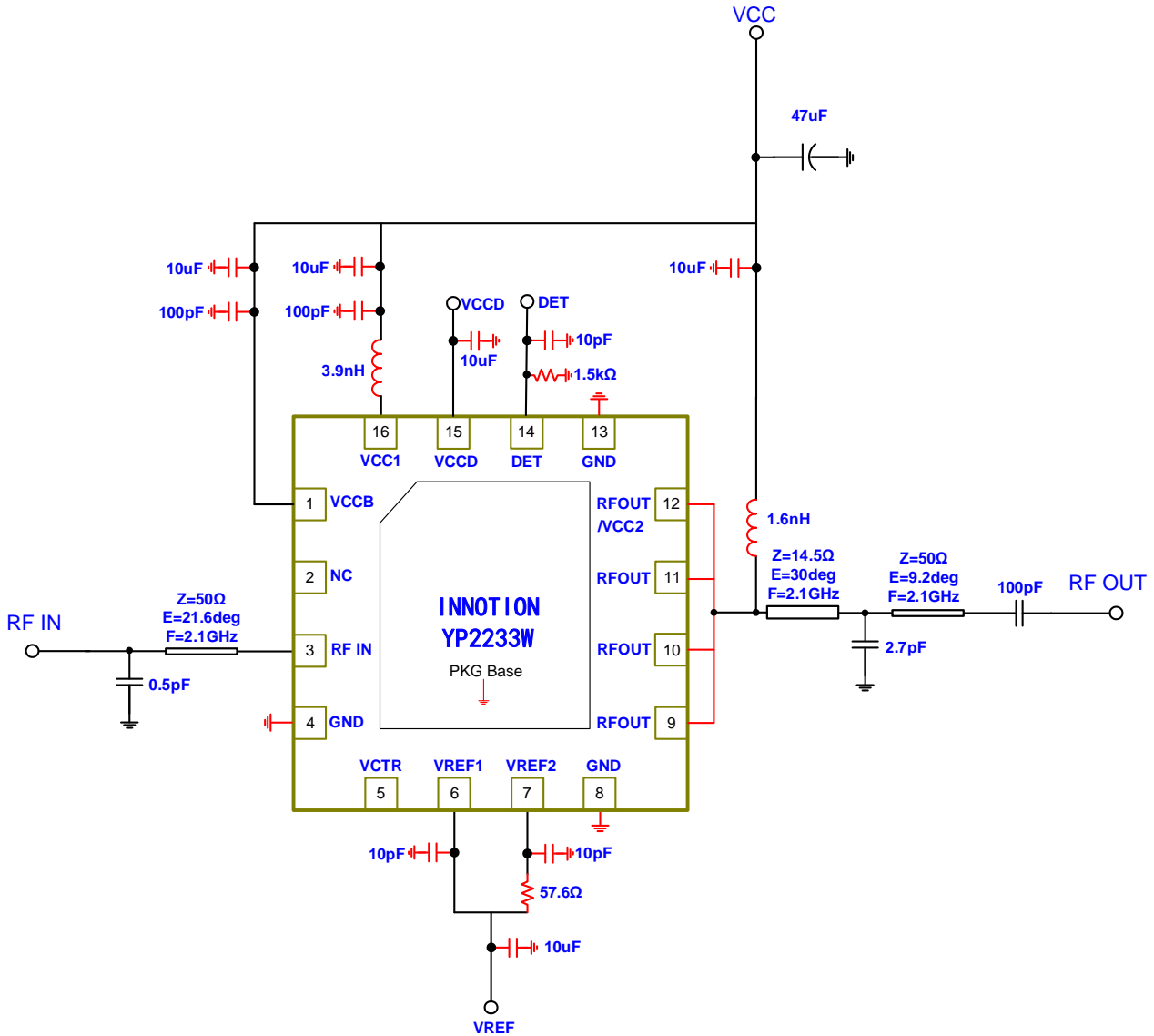




## Application Schematic

(Frequency range: 2.1GHz~2.2GHz)

(Test Condition:  $VCC1=VCC2=5.0V$ ,  $VREF1=VREF2=2.83V$ ,  $ICQ=440mA$ ,  $T_{OP}=+25^{\circ}C$ )



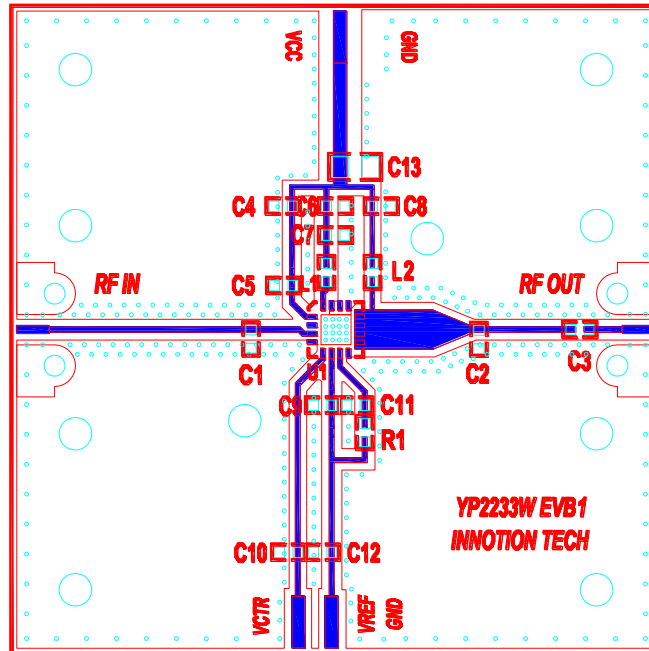
### Notes:

1. Pin5 is power down pin. Apply  $>2.5 V_{DC}$  to power down the three power amplifier stages. Apply  $0V_{DC}$  to power up. If function is not desired, pin5 may be connected to GND.
2. Pin14, 15 are active power detection circuit ports, if function is not desired, pin14, 15 may be connected to GND.

**Evaluation Board Layout: (Frequency range: 2.1GHz~2.2GHz)**

Board Size 50mm×50mm, Board Thickness 1mm, Board Material FR-4 ( $\epsilon_r=4.5$ )

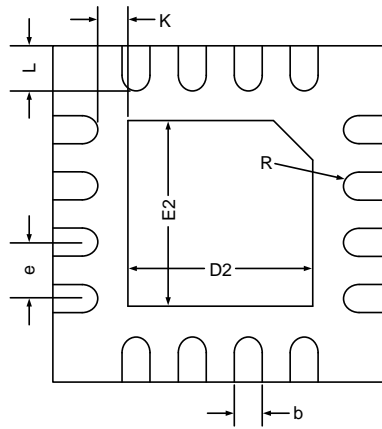
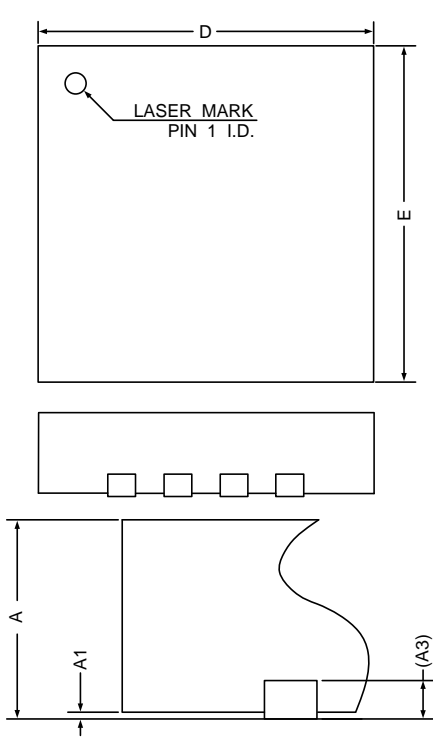
**Evaluation Board Top View**



**Circuit Component Designations and Values**

Component	Description	Manufacturer
L1	3.9nH Inductor	ATC
L2	1.6nH Inductor	ATC
C1	0.5pF Chip Capacitor	DLC
C2	2.7pF Chip Capacitor	DLC
C3, C5, C7, C9, C11	100pF Chip Capacitor	TDK
C4, C6, C8, C10, C12	10uF Chip Capacitor	TDK
C13	47uF Capacitor	AVX
R1	57.6ohm	TDK

### Packaging Diagram



COMMON DIMENSIONS  
(UNITS OF MEASURE = MILLIMETER)

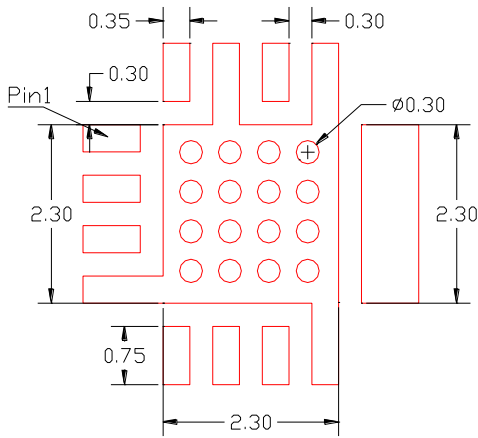
SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.203 REF		
b	0.25	0.30	0.35
D	3.95	4.00	4.05
E	3.95	4.00	4.05
D2	2.00	2.15	2.25
E2	2.00	2.15	2.25
e	0.60	0.65	0.70
K	0.375	—	—
L	0.35	0.40	0.45
R	0.09	—	—

**NOTE:**

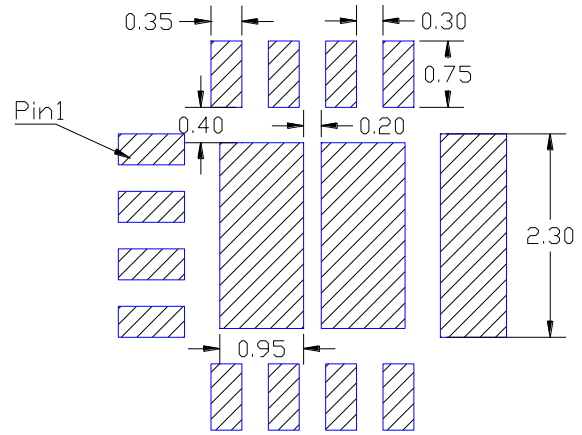
ALL DIMENSIONS REFER TO JEDEC STANDARD MO-220 WEED-4.

**PCB Land Pattern and Stencil Outline**

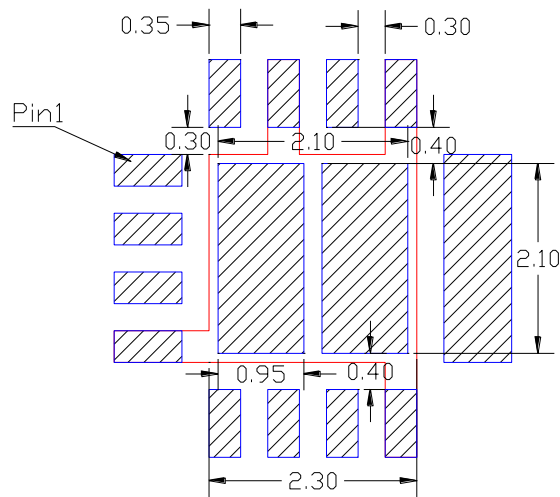
(Units: millimeters)



**PCB Land Pattern (Top View)**

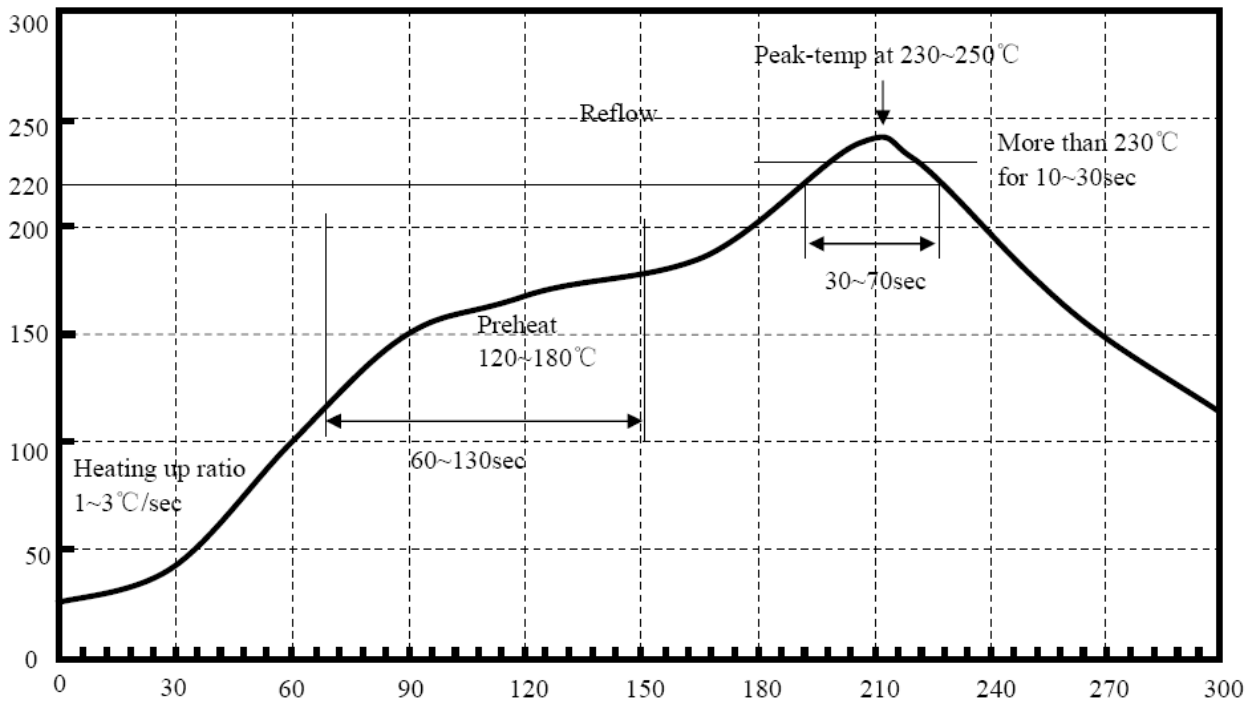


**Stencil Outline**



**Combined PCB Land Pattern and Stencil Outline**

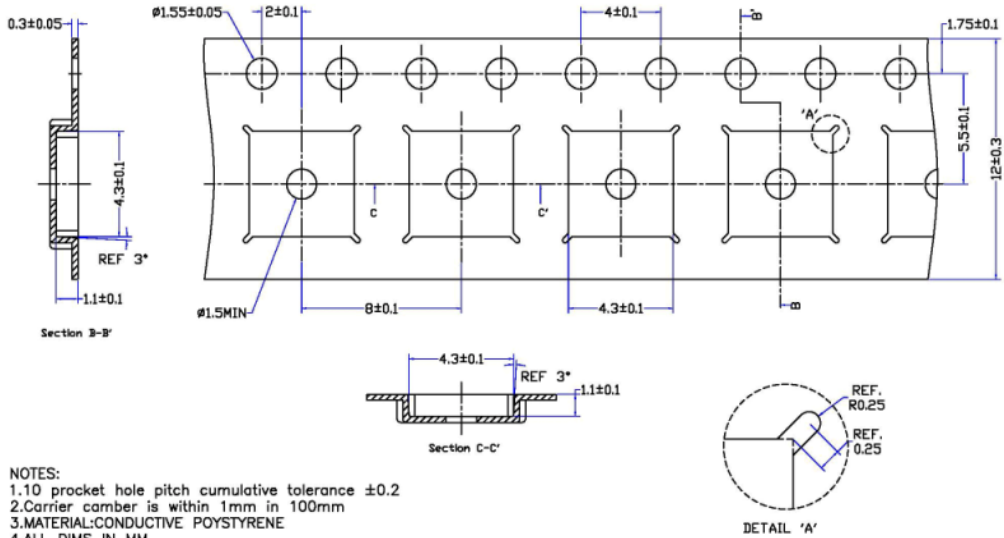
**Recommended Solder Temperature**



**Recommended Temperature**

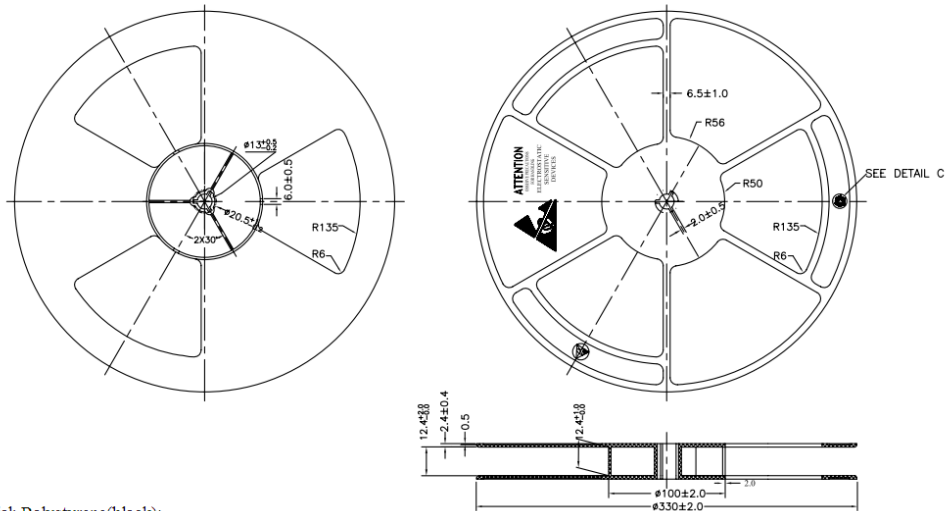
**Sn95.5Ag4.0Cu0.5**

### Tape dimensions and Orientation



- NOTES:**
- 1.10 pocket hole pitch cumulative tolerance  $\pm 0.2$
  - 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: 10<sup>5</sup> TO 10<sup>10</sup>/OHMS/SQ;
  5. General tolerances:  $\pm 0.25$