

Features

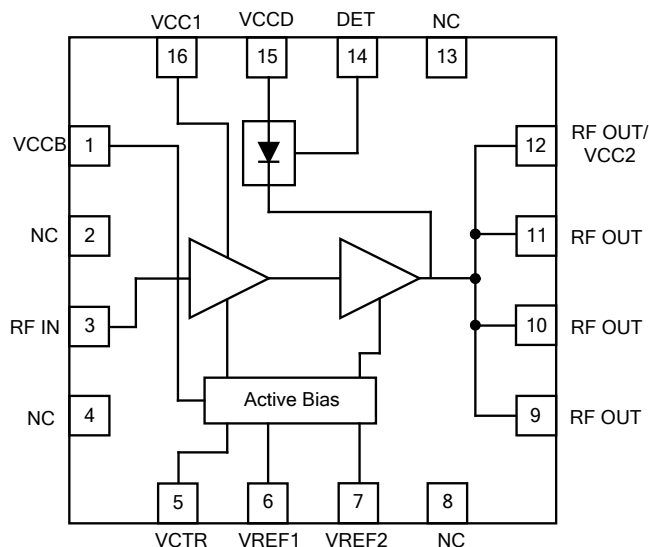
- 700~2700MHz Operating Range
- 3.3~5.0V Supply Voltage
- 26dB Gain (Typ.) @1.6GHz
- 34dBm P1dB @ Supply Voltage =5V
- 280mA Quiescent Current
- >15dB Input Return Loss
- Integrated Output Power Detector
- ESD protection all ports above 1000V HBM

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 _{OP}	-40 to +85	°C
Storage Temperature	T _{ST}	-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_{OP}=+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 ₂₁	26.5	27	27.5	dB	@1.25GHz
Power Supply					
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

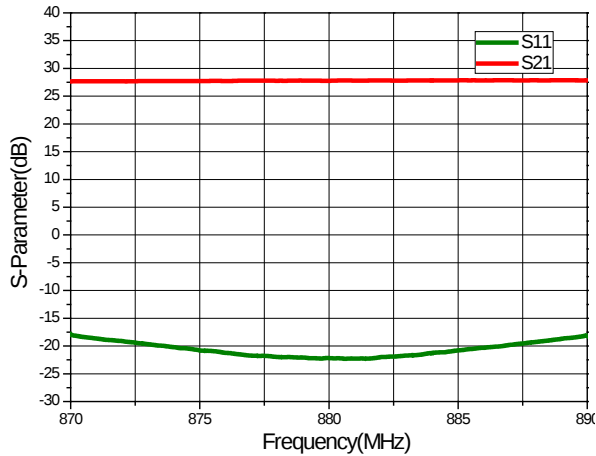


Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency Range	1.6	1.63	1.65	GHz	
Output Power@1dB Compression	34	34.5	34.7	dBm	@1.63GHz
Gain, S ₂₁	25.5	26	26.5	dB	@1.63GHz
Power Supply					
Reference Voltage 1, VREF1		2.68		V	
Reference Voltage 2, VREF2		2.68		V	
Quiescent Current (Total),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

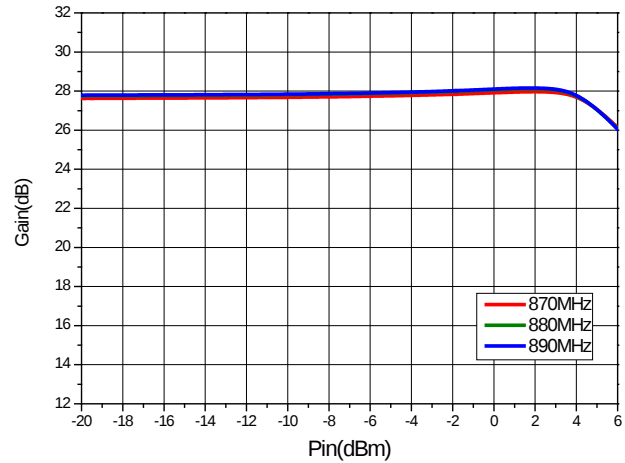
Typical Performance

(Frequency range: 870MHz~890MHz)

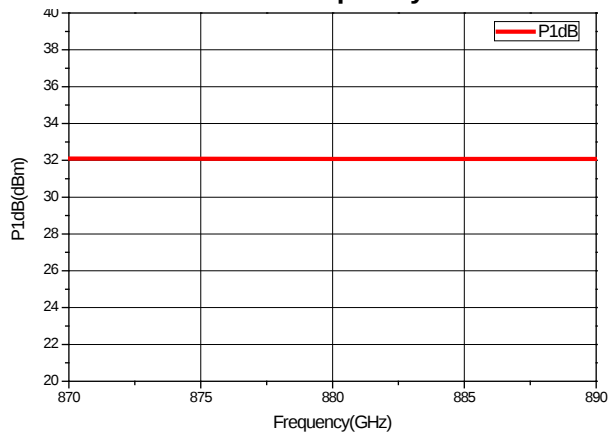
Narrowband Gain & Return Loss



Power Gain vs. Input Power



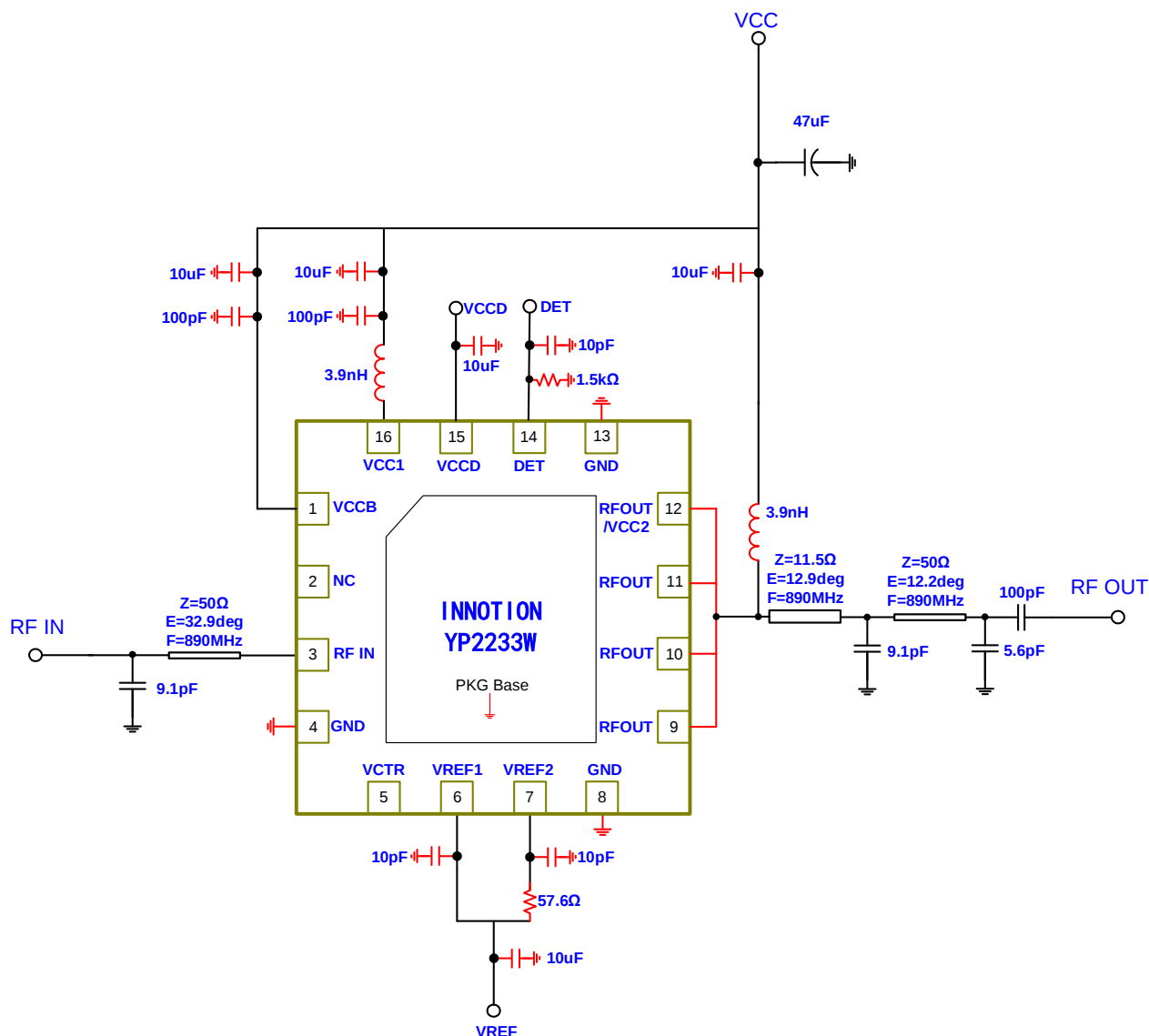
P1dB vs. Frequency



Application Schematic

(Frequency range: 870MHz~890MHz)

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



Notes:

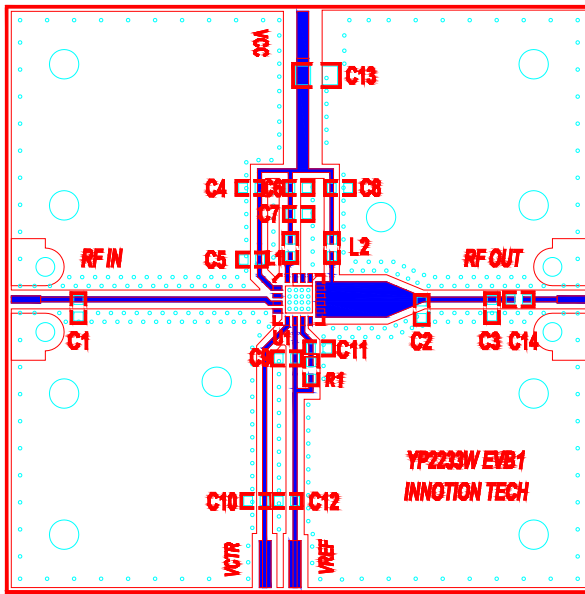
1. Pin5 is power down pin. Apply $>2.5 V_{DC}$ to power down the three power amplifier stages. Apply $0V_{DC}$ to power up. If function is not desired, pin5 may be connected to GND.
2. Pin14, 15 are active power detection circuit ports, if function is not desired, pin14, 15 may be connected to GND.

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	ϵ_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	--

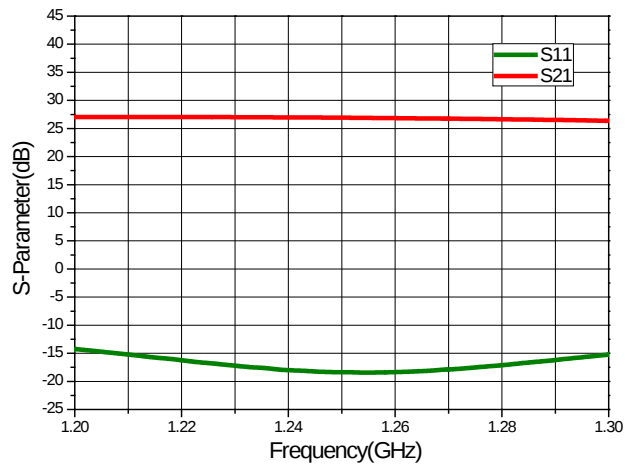
Circuit Component Designations and Values

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

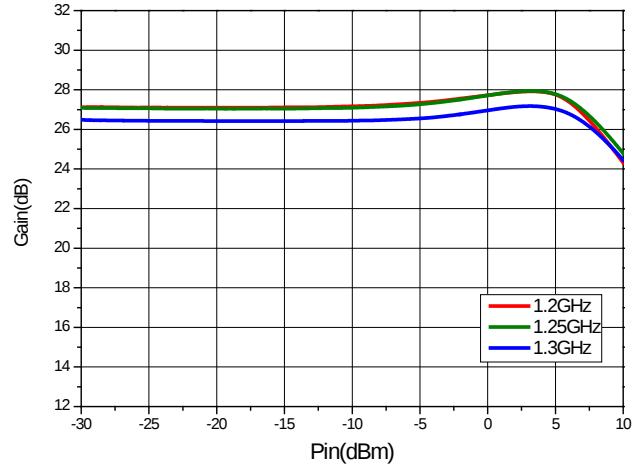
Typical Performance

(Frequency range: 1.2GHz~1.3GHz)

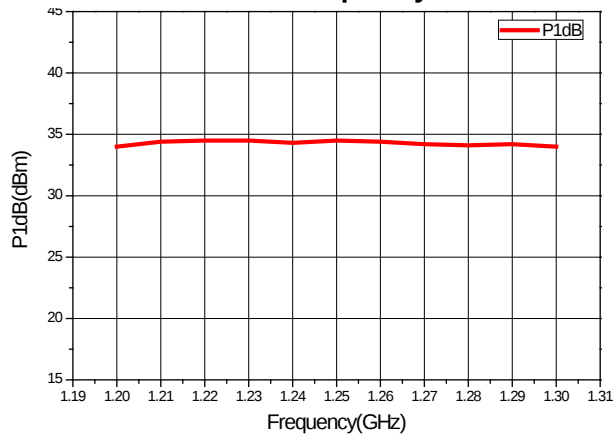
Narrowband Gain & Return Loss



Power Gain vs. Input Power



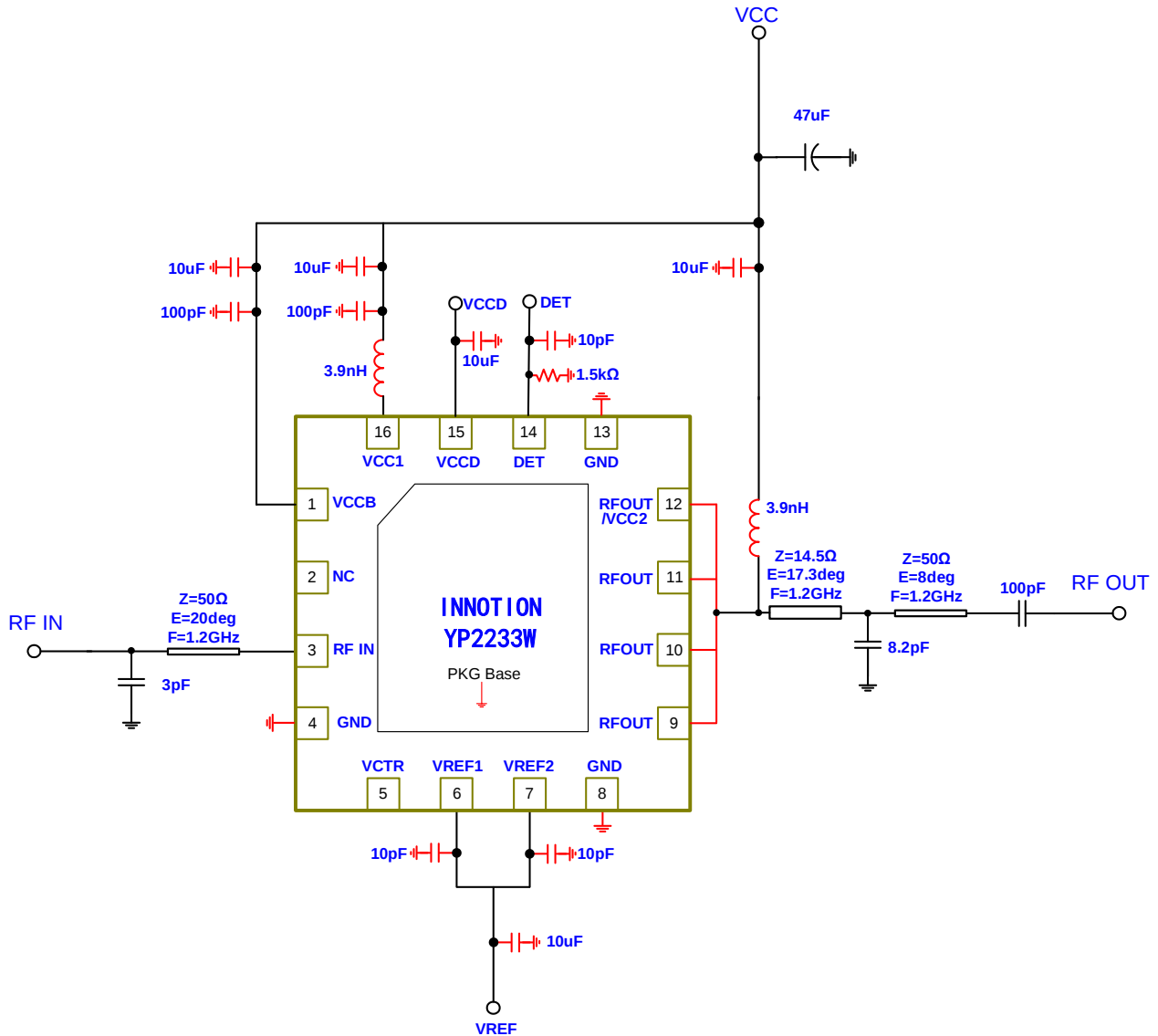
P1dB vs. Frequency



Application Schematic

(Frequency range: 1.2GHz~1.3GHz)

(Test Condition: $V_{CC1}=V_{CC2}=5.0V$, $V_{REF1}=V_{REF2}=2.65V$, $I_{CQ}=240mA$, $T_{OP}=+25^{\circ}C$)



Notes:

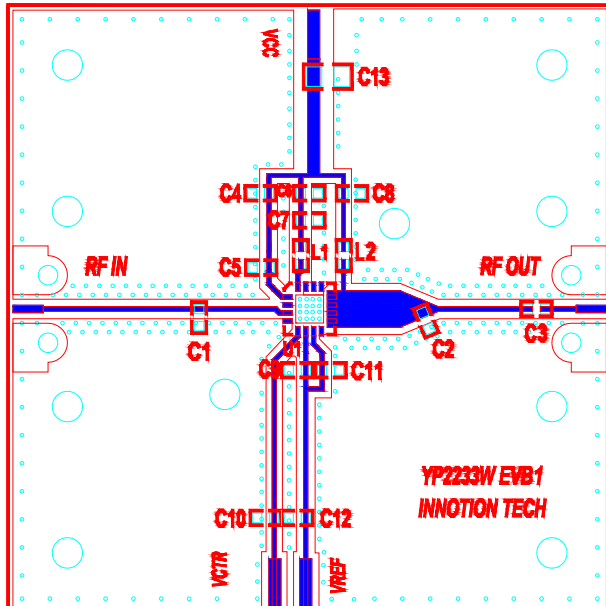
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Evaluation Board Layout

(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	ϵ_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	--

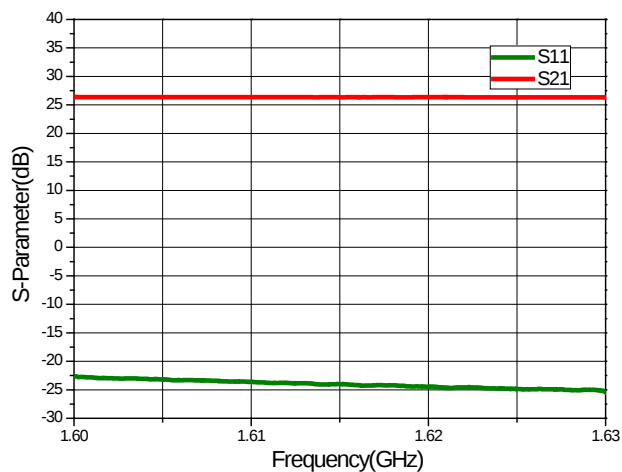
Circuit Component Designations and Values

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

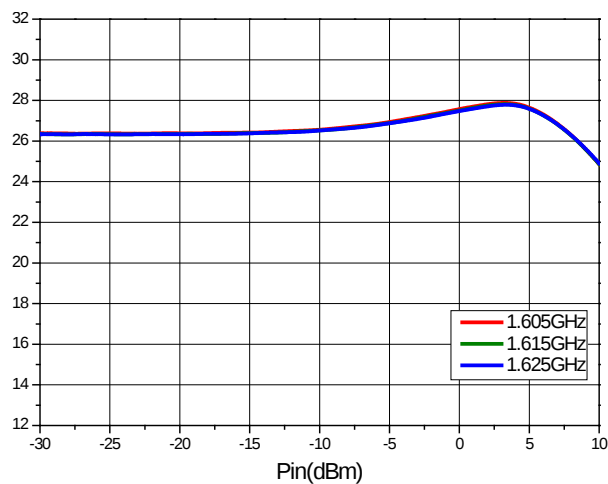
Typical Performance

(Frequency range: 1.6GHz~1.63GHz)

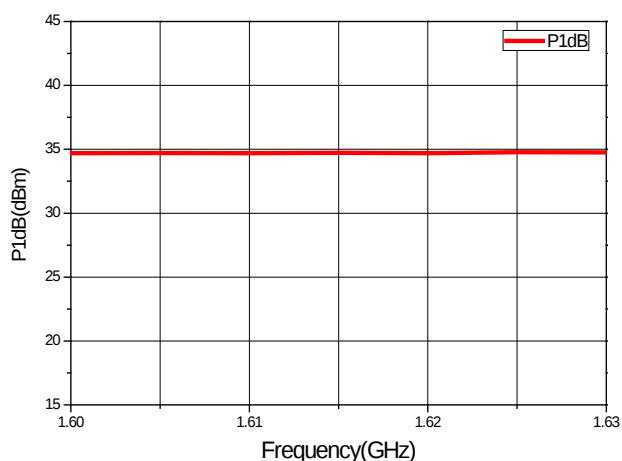
Narrowband Gain & Return Loss



Power Gain vs. Input Power



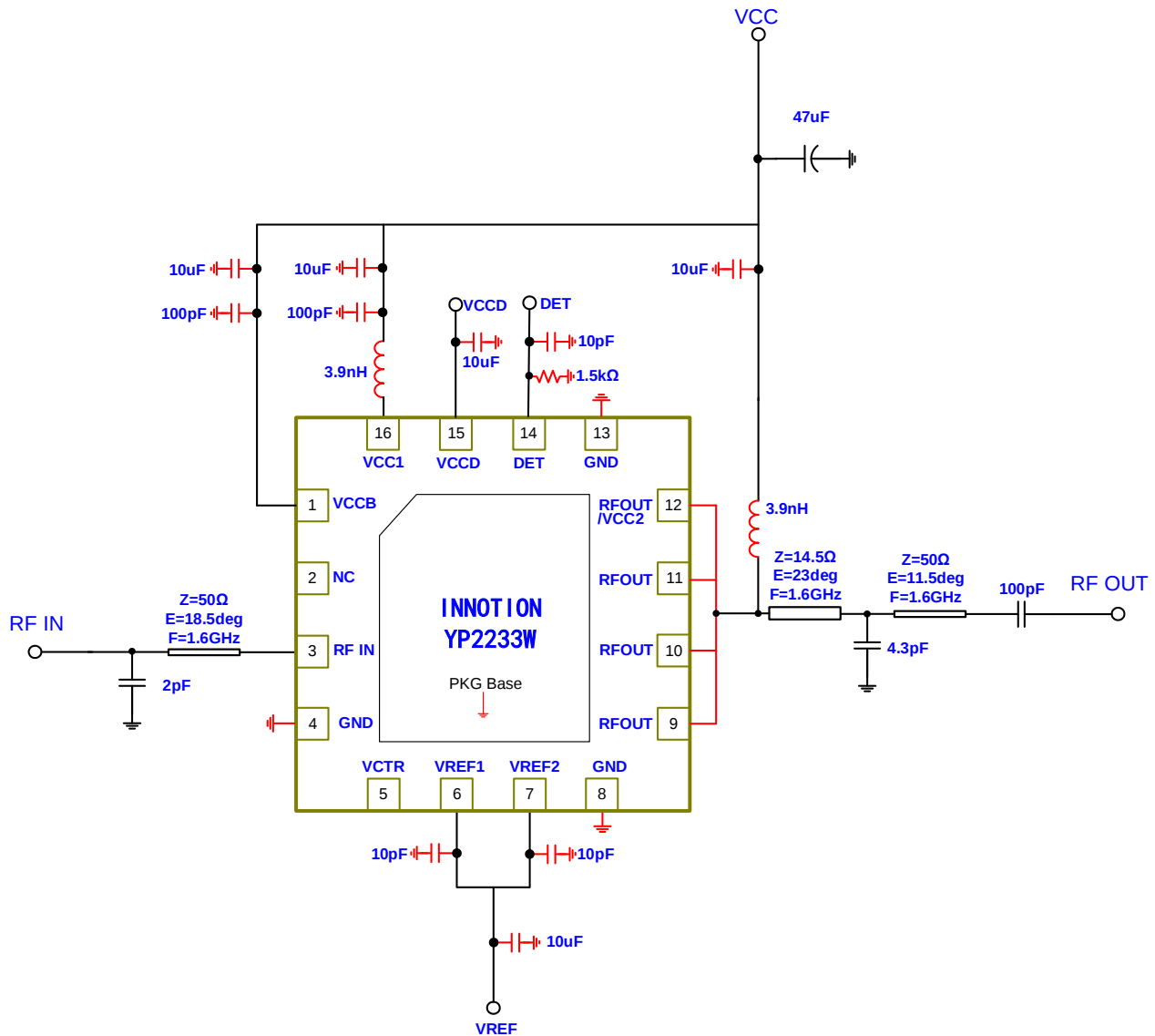
P1dB vs. Frequency



Application Schematic

(Frequency range: 1.6GHz~1.63GHz)

(Test Condition: $V_{CC1}=V_{CC2}=5.0V$, $V_{REF1}=V_{REF2}=2.68V$, $I_{CQ}=280mA$, $T_{OP}=+25^{\circ}C$)



Notes:

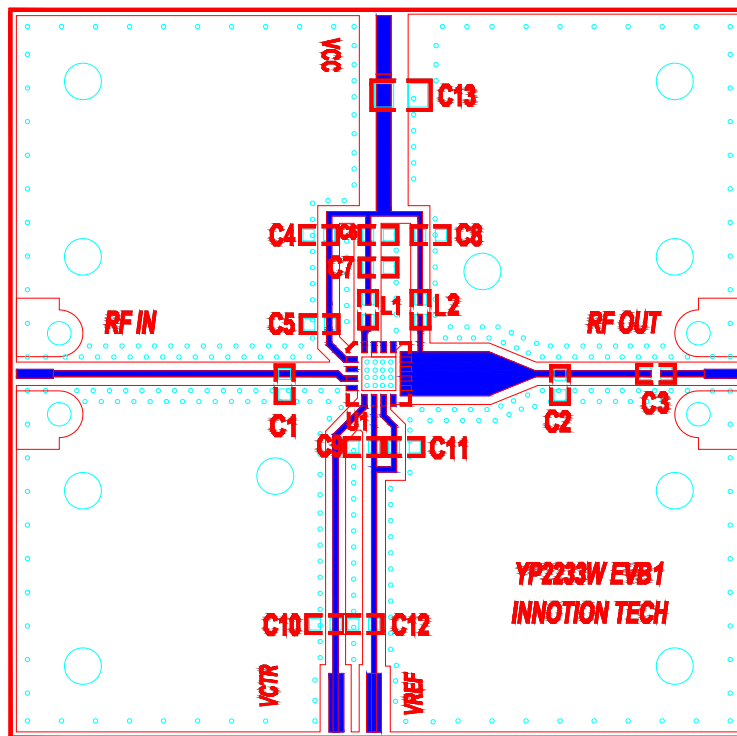
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Evaluation Board Layout

(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



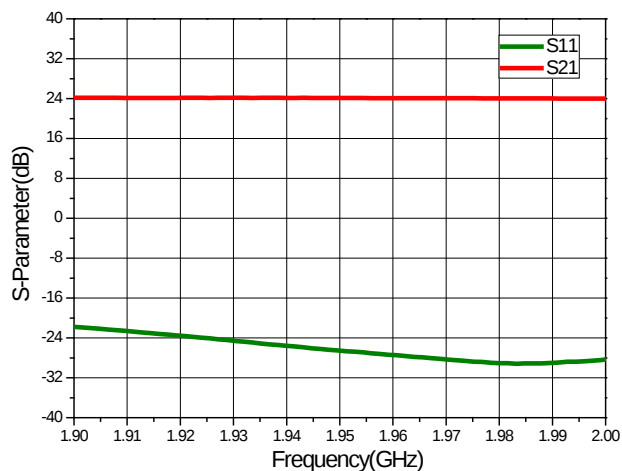
Circuit Component Designations and Values

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

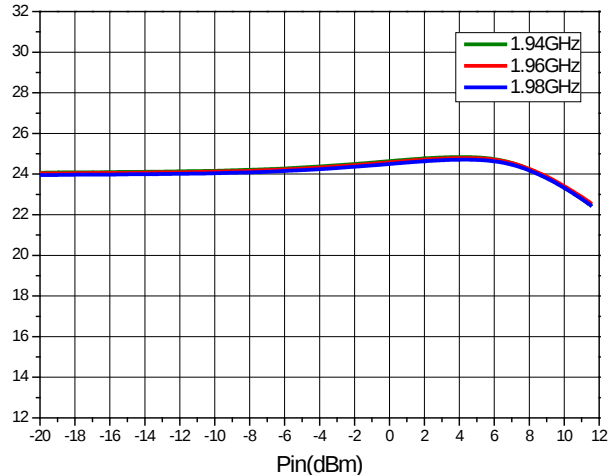
Typical Performance

(Frequency range: 1.9GHz~2.0GHz)

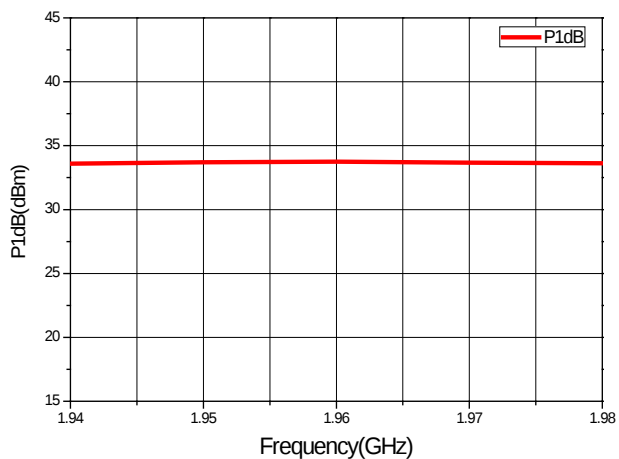
Narrowband Gain & Return Loss



Power Gain vs. Input Power



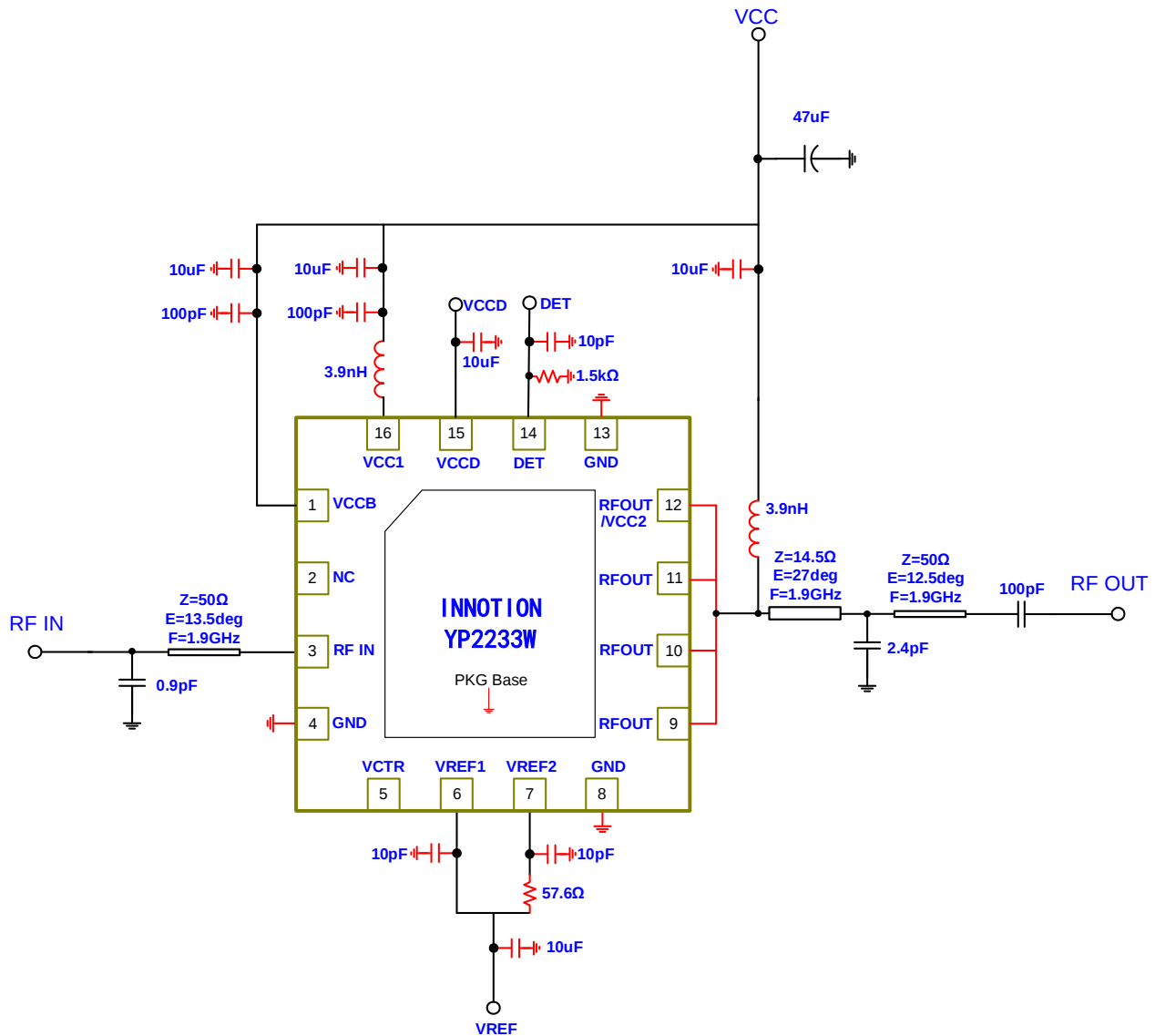
P1dB vs. Frequency



Application Schematic

(Frequency range: 1.9GHz~2.0GHz)

(Test Condition: $V_{CC1}=V_{CC2}=5.0V$, $V_{REF1}=V_{REF2}=2.78V$, $I_{CQ}=340mA$, $T_{OP}=+25^{\circ}C$)



Notes:

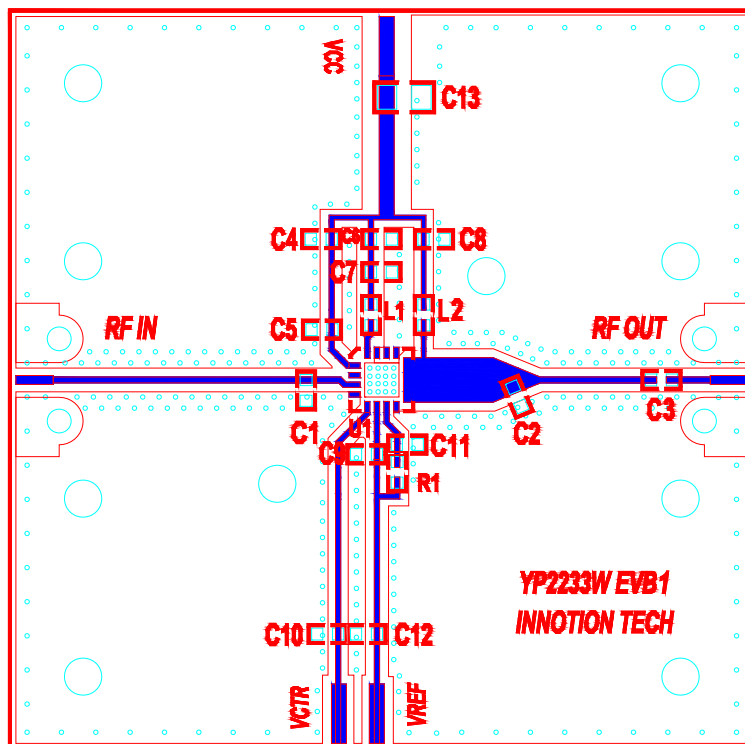
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Evaluation Board Layout

(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



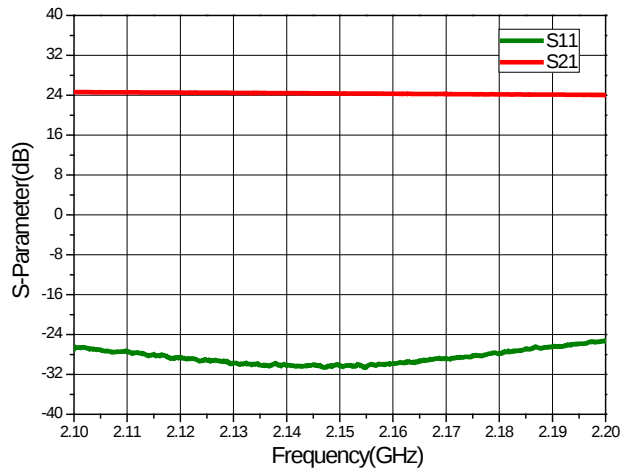
Circuit Component Designations and Values

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

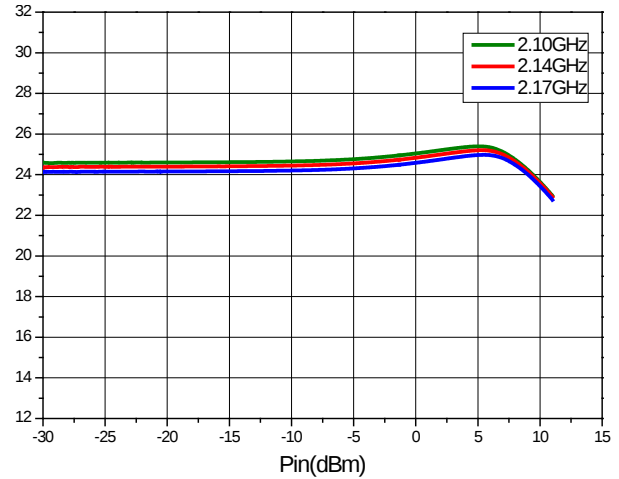
Typical Performance

(Frequency range: 2.1GHz~2.2GHz)

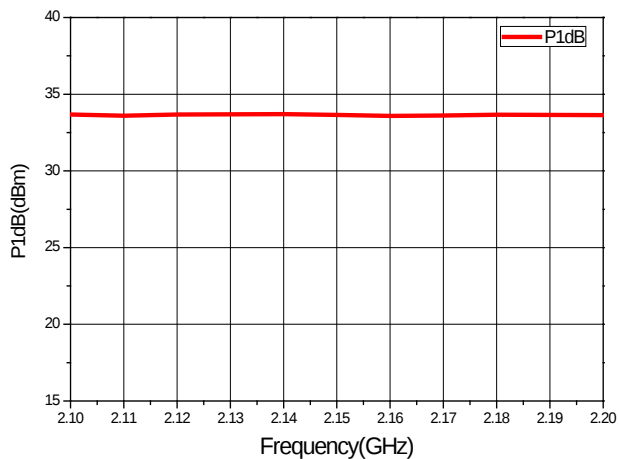
Narrowband Gain & Return Loss



Power Gain vs. Input Power



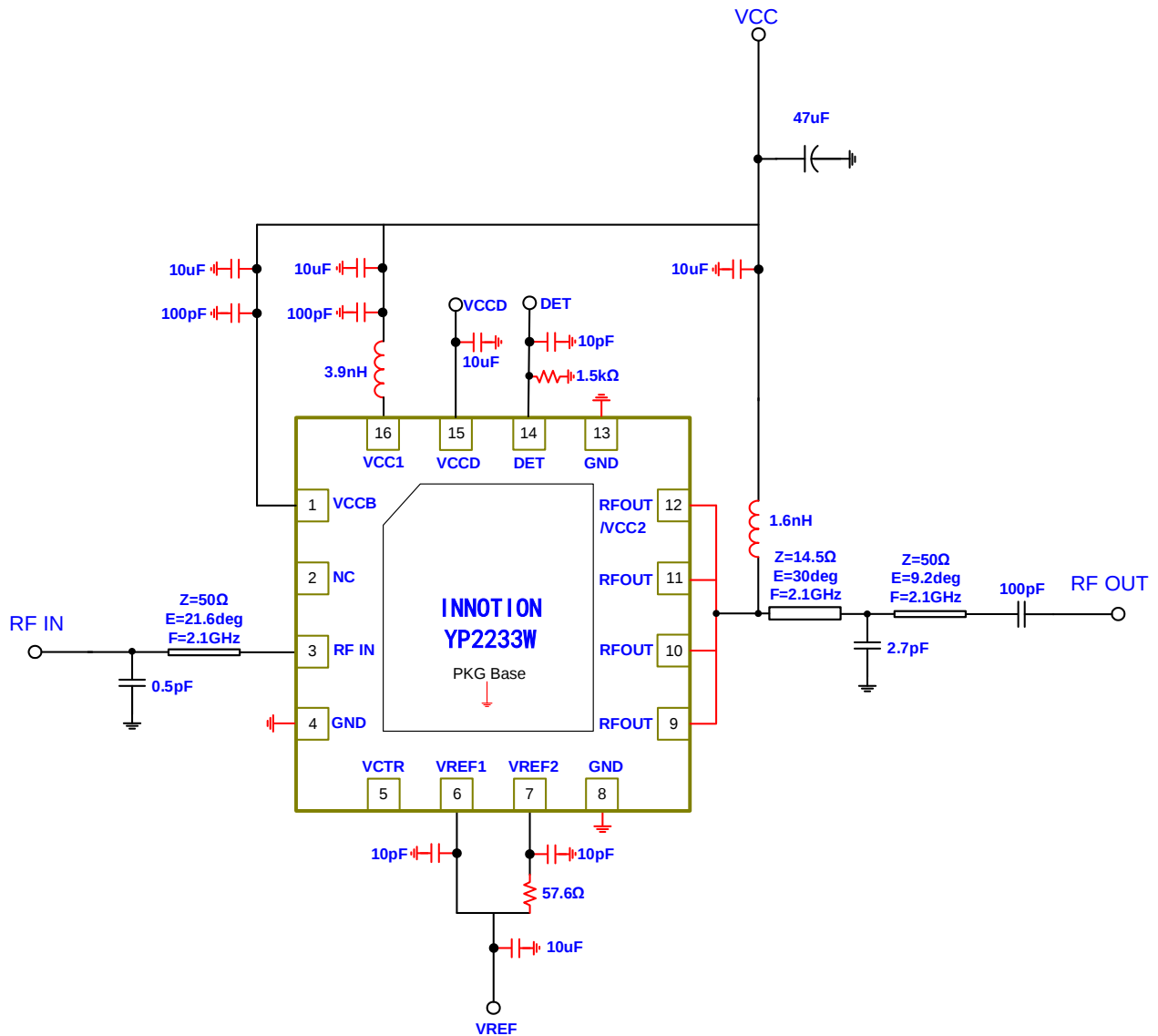
P1dB vs. Frequency



Application Schematic

(Frequency range: 2.1GHz~2.2GHz)

(Test Condition: $V_{CC1}=V_{CC2}=5.0V$, $V_{REF1}=V_{REF2}=2.83V$, $I_{CQ}=440mA$, $T_{OP}=+25^{\circ}C$)



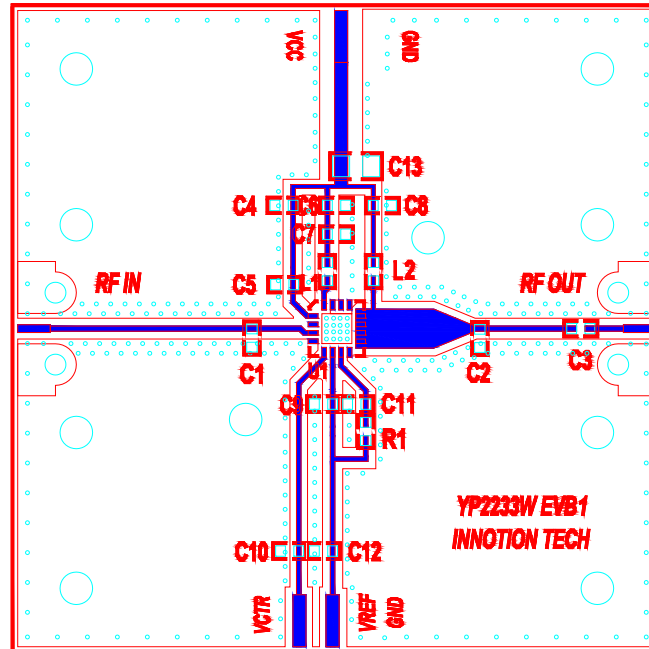
Notes:

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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: 2.1GHz~2.2GHz)

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

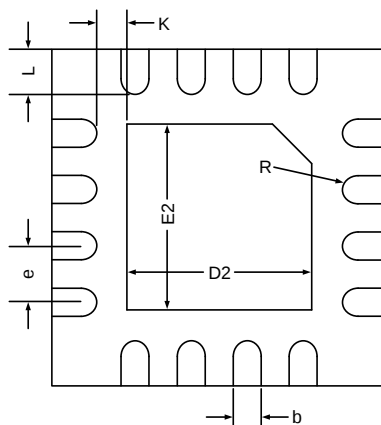
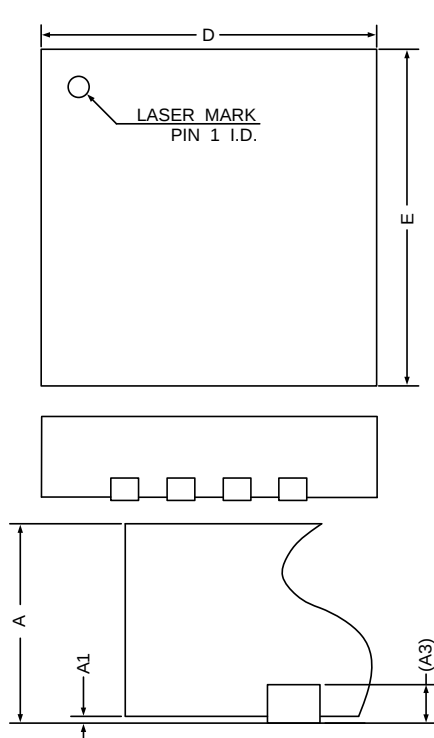
Evaluation Board Top View



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



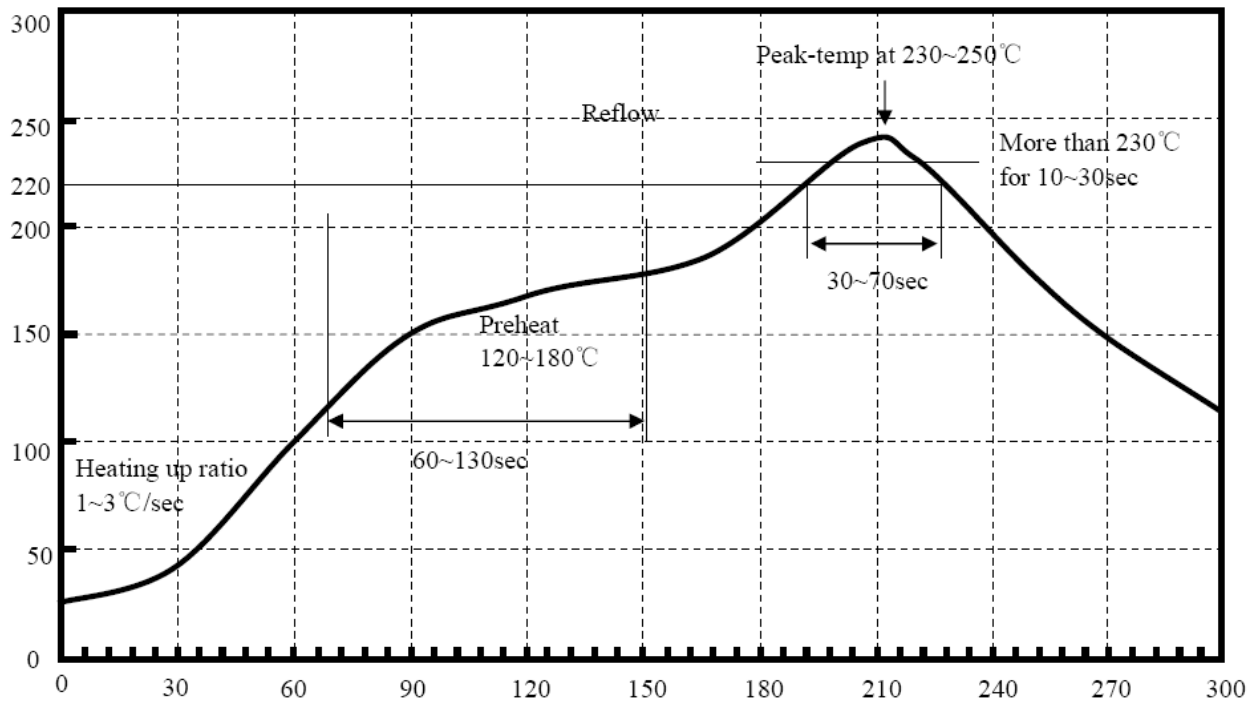
COMMON DIMENSIONS
(UNITS OF MEASURE = MILLIMETER)

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.

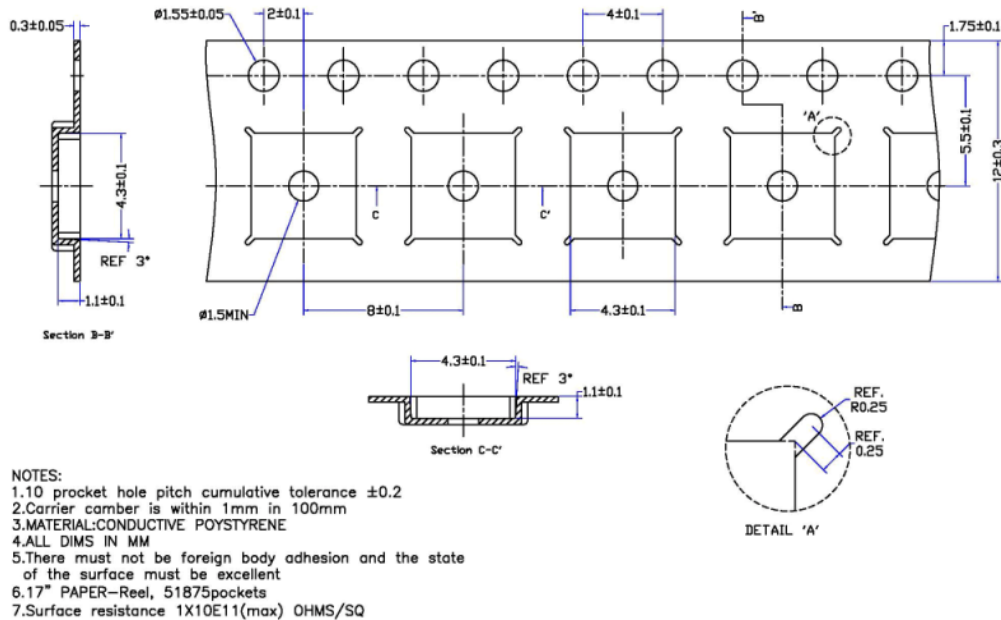
Recommended Solder Temperature



Recommended Temperature

Sn95.5Ag4.0Cu0.5

Tape dimensions and Orientation



Reel dimensions and Orientation

