Power Transistor RT230PD

RFHIC

Product Features

- 50 ~ 4000 MHz
- 18dB Gain@900MHz
- 34.5dBm P1dB@900MHz
- 47dBm Output IP3
- GaAs HFET

Application

- CDMA,W-CDMA Medium Power Amplifier
- High Linearity Drive Amplifier
- ISM
- MMDS
- Wi-Fi, Wi-Max

Package : SP-12

Description

The RT230PD is designed for base stations and cell extenders and operating frequency range is from 50MHz to 4GHz. RT230PD is GaAs HFET in SP-12 type package which has superior performance against the heat at high temperature for its high reliability. It also has high efficiency, high gain and has a strong advantage using it as drive device at high frequency.
RT230PD is 100% RF&DC tested.

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Drain to Source Voltage	Vds	+12	V
Gate to Source Voltage Range	Vgs	0 to -5.0	V
Power Dissipation	Pt	7.5	W
Storage Temperature	Tstg	-65 to +175	℃
Channel Temperature	Tch	+175	℃

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Saturated Drain Current	Idss		1100		mA
Transconductance	gm	-	790		mS
Pinch-off Voltage	Vp	-1	-1.8	-3	V
Breakdown Voltage Gate-Source	Bvgs	-18		-25	V
Breakdown Voltage Gate-Drain	Bvgd	-18		-25	V
Output Power @ 1dB G.C.P	P1dB	34	34.5		dBm
Power Gain @ 1dB G.C.P	G1dB		14.5		dB
Power added efficiency	ηadd		50		%
Thermal Resistance	Rth		18	20	℃/W

* Test Conditions : V_d=9V, I_d=450mA, Ta=+25℃, Frequency=2.3GHz

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Electrical Specifications

Parameter	UNIT	Typical		
Frequency Range	MHz	900	1900	2600
Gain	dB	18	16.5	14.5
Input Return Loss	dB	-15	-20	-20
Output IP3	dBm	+47	+47	+47
1dB Compression Point	dBm	+34.5	+34.5	+34
Channel Power	dBm	27.5	25.5	
Noise Figure	dB	2.5	2.5	3.0
DC Current	mA	450	450	450
Supply Voltage	VDC	+9	+9	+9

*Test Conditions : (V_d = +9V, I_d = 450mA, Ta=+25℃)

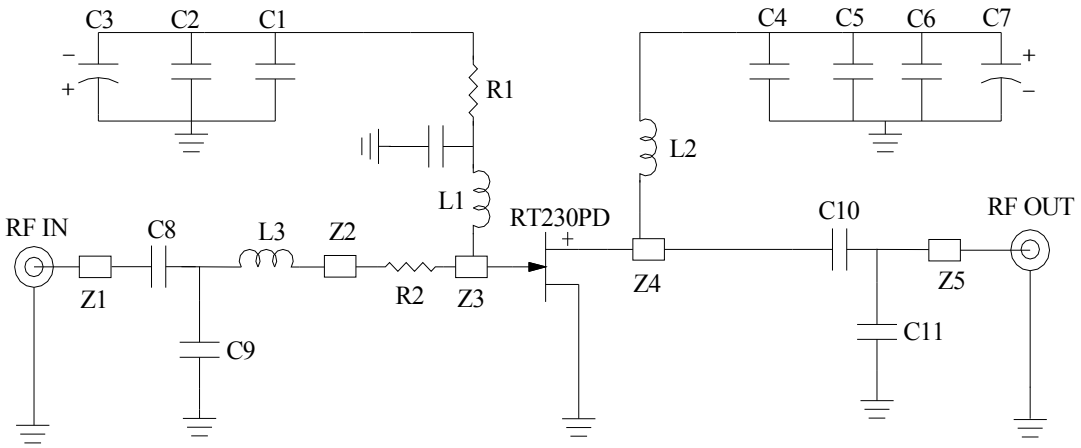
*OIP3 is measured with two tones, at an output power of 20dBm/tone separated by 1MHz

Application Circuit for RT230PD(824 ~ 896MHz)

Performance Charts (V_d = +9V, I_d = 450mA, Ta = 25℃)

Typical Specifications				
Frequency Range	MHz	824	860	896
Gain	dB	18.5	18.3	18
Input Return Loss	dB	-15	-20	-16
Output P1dB	dBm		34.5	
Output IP3	dBm		47	
Noise Figure	dB		2.5	
Channel Power@-45dBc ACPR	dBm		27.5	

Application Circuit



Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**L1**	**18nH**	**1608**
C1,C5	**1000pF**	**1608**	**L2**	**18nH**	**2520**
C2,C6	**0.1uF**	**1608**	**L3**	**3.9nH**	**1608**
C3,C7	**4.7uF**	**3216**	**Z1**	**W × L**	**1.4 × 2.0**
C8,C10	**30pF**	**1608**	**Z2**		**1.4 × 1.5**
C9	**5pF**	**1608**	**Z3**		**1.4 × 2.0**
C11	**4pF**	**1608**	**Z4**		**1.4 × 6.0**
R1	**51 Ω**	**1608**	**Z5**		**1.4 × 3.0**
R2	**8.2 Ω**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

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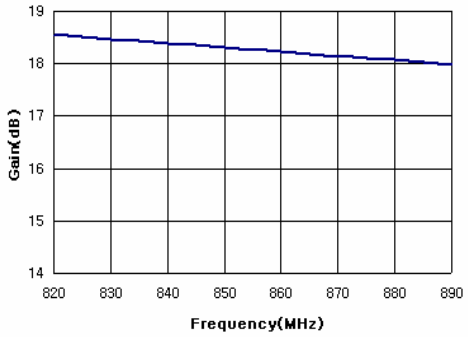
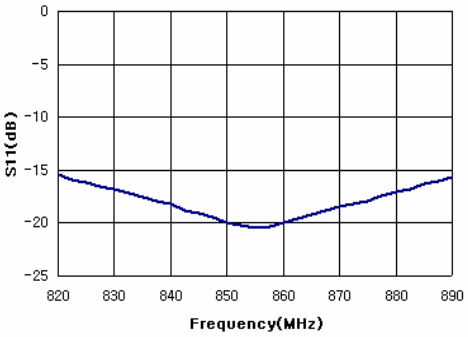
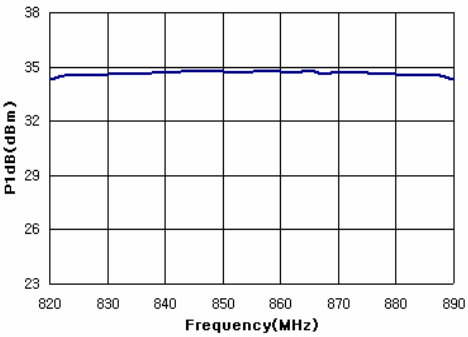
Gain vs Frequency



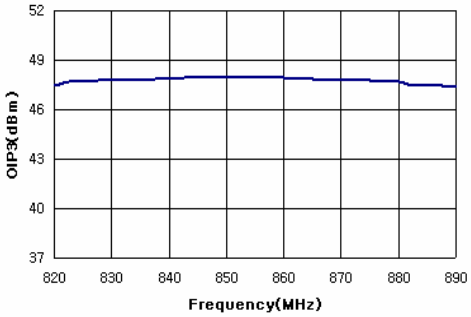
S11 vs Frequency



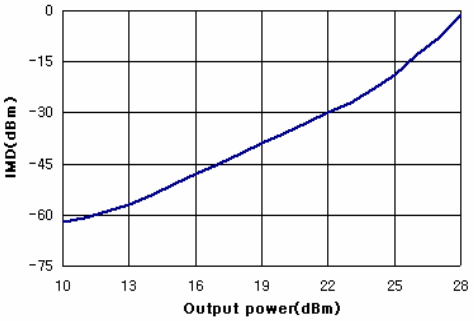
P1dB vs Frequency



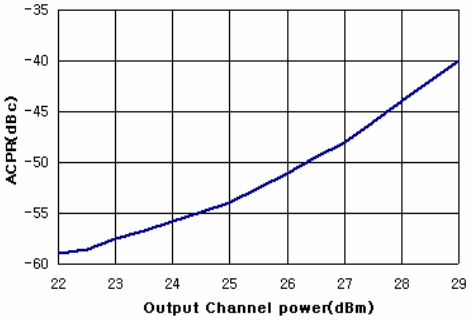
OIP3 vs Frequency
20dBm/tone separated by 1MHz



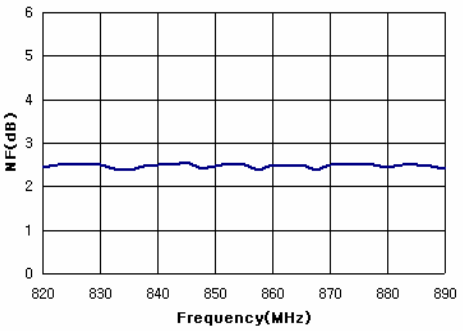
IMD vs Output Power
Fundamental Frequency=880,881MHz



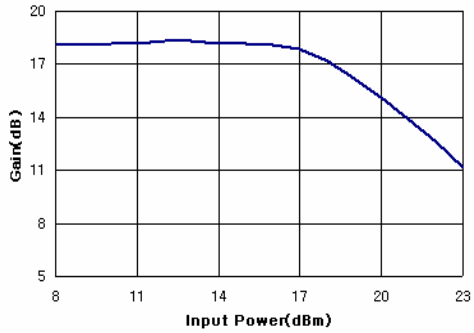
ACPR vs Output Channel Power
9ch Forward, ±750 offset, 30kHz Meas BW



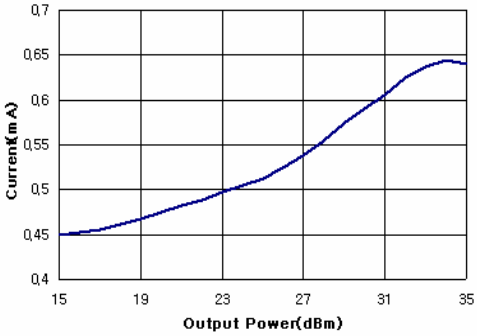
Noise Figure vs Frequency



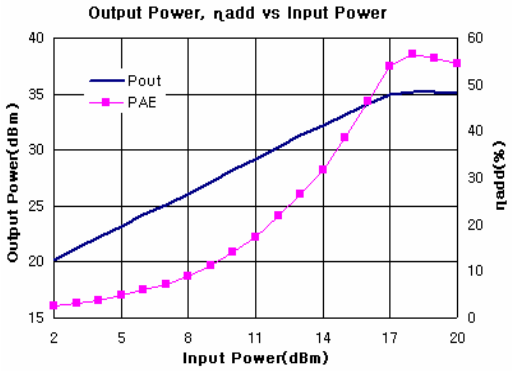
Gain vs Input Power



Current vs Output Power



Output Power, ηadd vs Input Power



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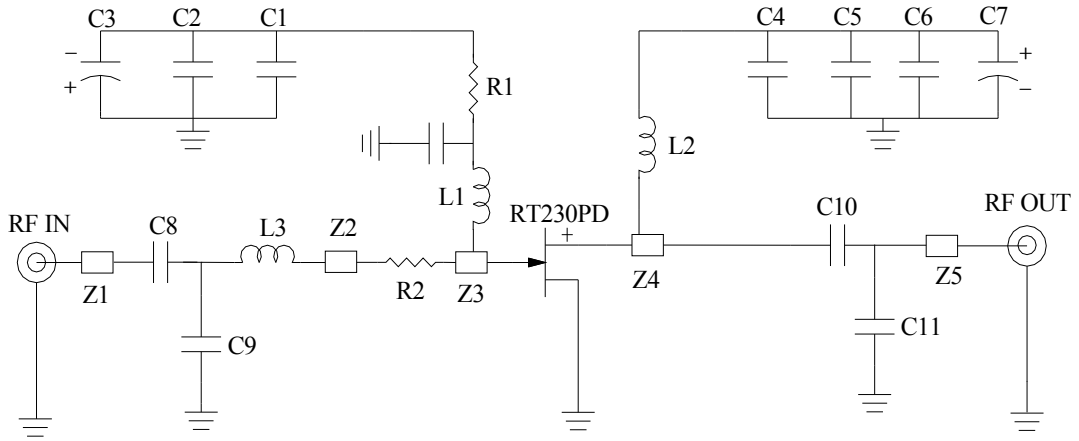
Application Circuit for RT230PD(890 ~ 960MHz)

Performance Charts (V_d = +9V, I_d = 450mA, Ta = 25℃)

Typical Specifications				
Frequency Range	**MHz**	**890**	**925**	**960**
Gain	**dB**	**18.2**	**18**	**17.8**
Input Return Loss	**dB**	**-14**	**-18**	**-16**
Output P1dB	**dBm**		**34.5**	
Output IP3	**dBm**		**47**	
Noise Figure	**dB**		**2.5**	
Channel Power@-45dBc ACPR	**dBm**		**27.5**	

Application Circuit (890 ~ 960MHz)



Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**L1**	**18nH**	**1608**
C1,C5	**1000pF**	**1608**	**L2**	**18nH**	**2520**
C2,C6	**0.1uF**	**1608**	**L3**	**3.3nH**	**1608**
C3,C7	**4.7uF**	**3216**	**Z1**	**W x L**	**1.4 x 2.0**
C8,C10	**30pF**	**1608**	**Z2**		**1.4 x 1.5**
C9	**5pF**	**1608**	**Z3**		**1.4 x 2.0**
C11	**4pF**	**1608**	**Z4**		**1.4 x 6.0**
R1	**51 Ω**	**1608**	**Z5**		**1.4 x 3.0**
R2	**8.2 Ω**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

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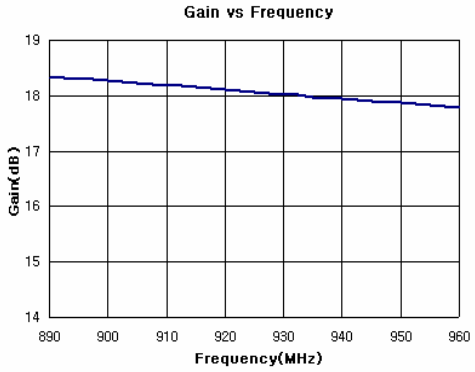

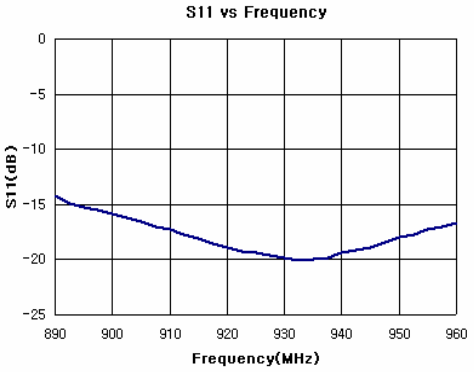

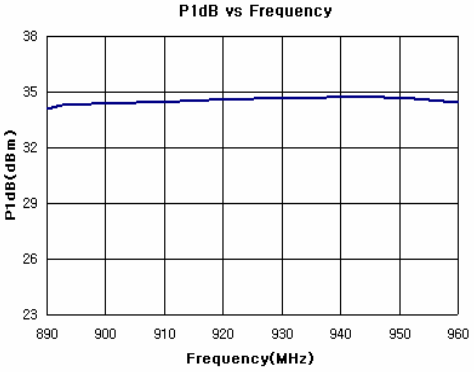

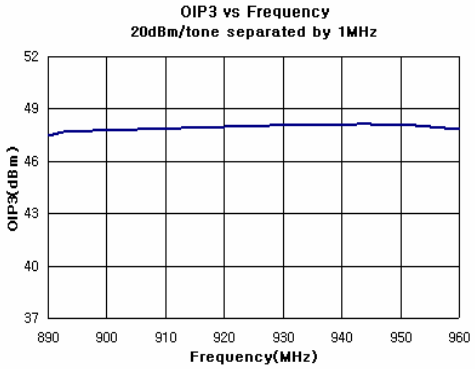

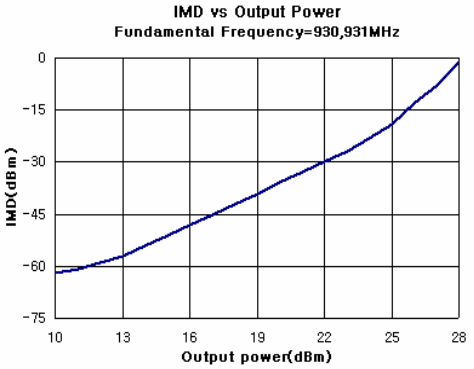

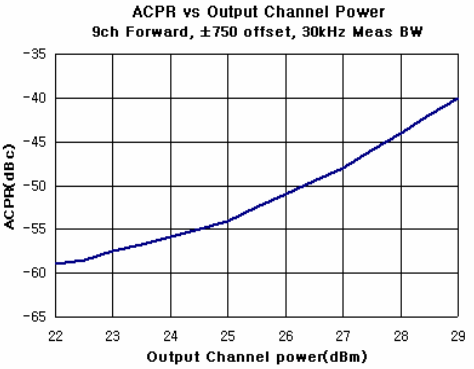

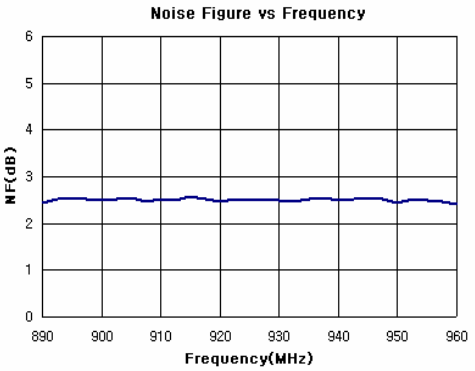

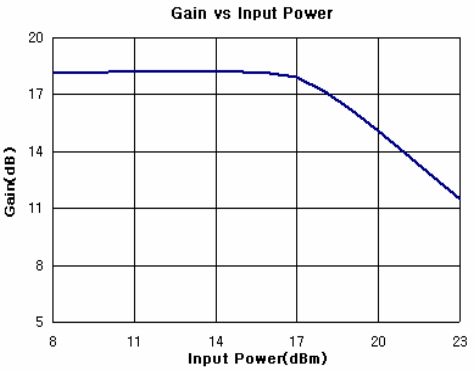

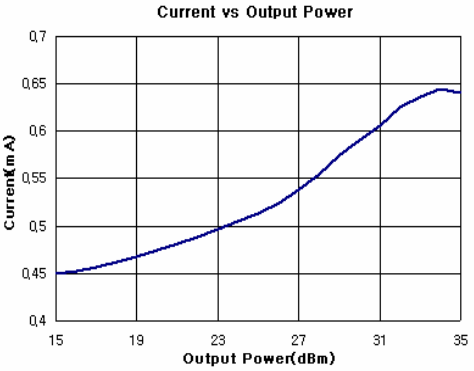

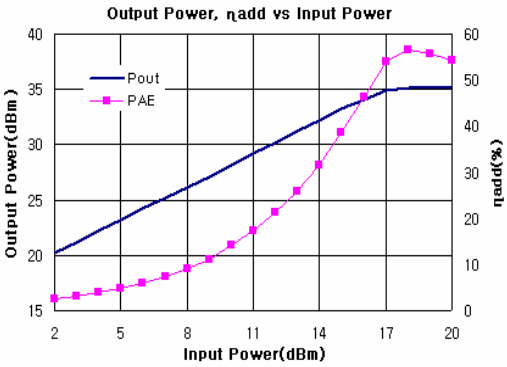

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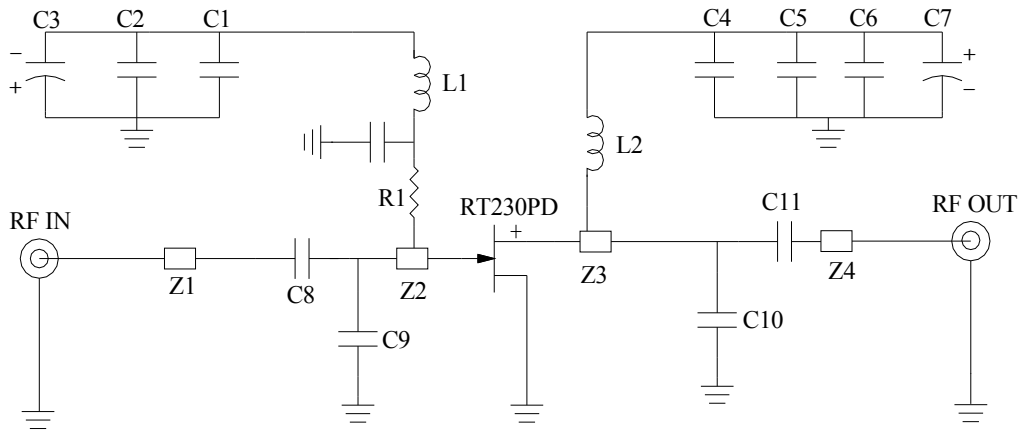
Application Circuit for RT230PD(1700 ~ 1800MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

Typical Specifications				
Frequency Range	**MHz**	**1700**	**1750**	**1800**
Gain	**dB**	**16.8**	**17.3**	**16.5**
Input Return Loss	**dB**	**-13**	**-17**	**-11**
Output P1dB	**dBm**		**34.5**	
Output IP3	**dBm**		**47**	
Noise Figure	**dB**		**2.5**	
Channel Power@ -45dBc ACPR	**dBm**		**27.5**	

Application Circuit (1700 ~ 1800MHz)



Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**R1**	**51 Ω**	**1608**
C1,C5	**1000pF**	**1608**	**L1**	**18nH**	**1608**
C2,C6	**0.1uF**	**1608**	**L2**	**18nH**	**2520**
C3,C7	**4.7uF**	**3216**	**Z1**	**W x L**	**1.4 x 7.0**
C8	**10pF**	**1608**	**Z2**		**1.4 x 2.0**
C9	**3.6pF**	**1608**	**Z3**		**1.4 x 2.0**
C10	**1.5pF**	**1608**	**Z4**		**1.4 x 7.0**
C11	**5pF**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

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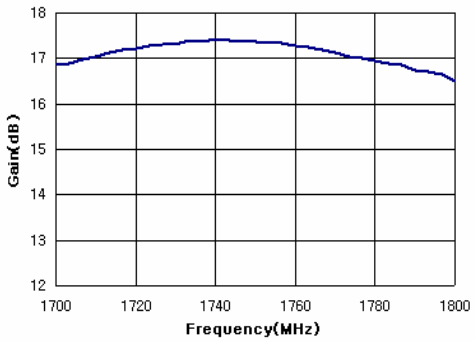
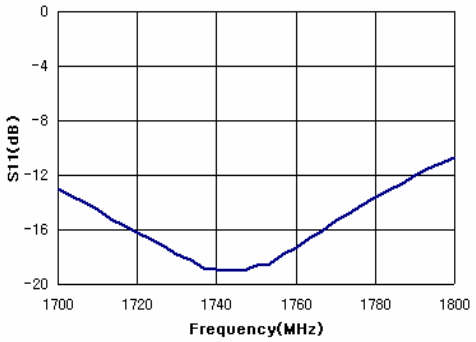
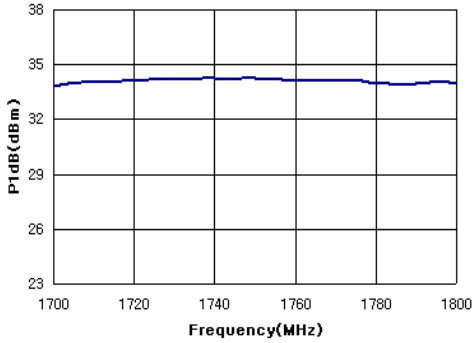
Gain vs Frequency



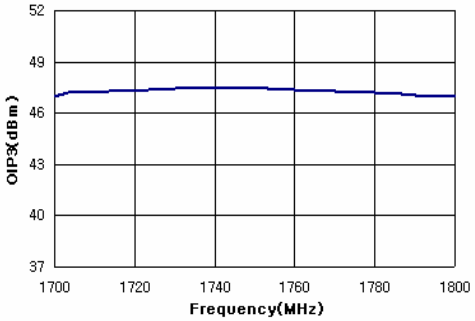
S11 vs Frequency



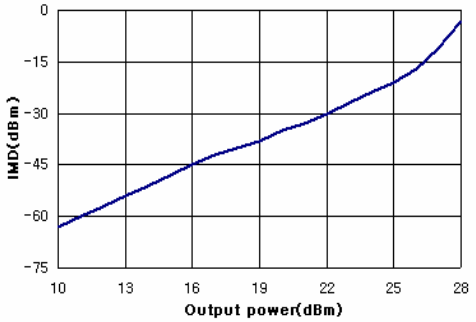
P1dB vs Frequency



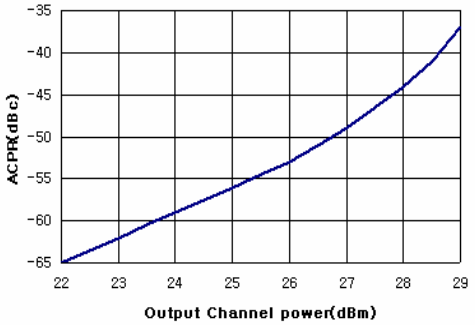
OIP3 vs Frequency
20dBm/tone separated by 1MHz



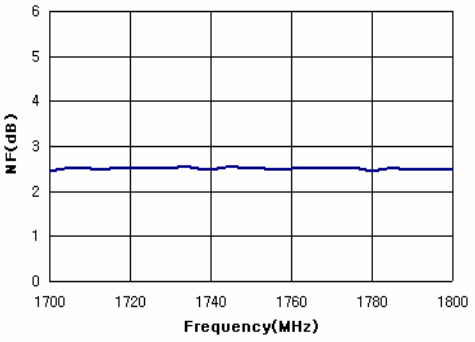
IMD vs Output Power
Fundamental Frequency=1770,1771MHz



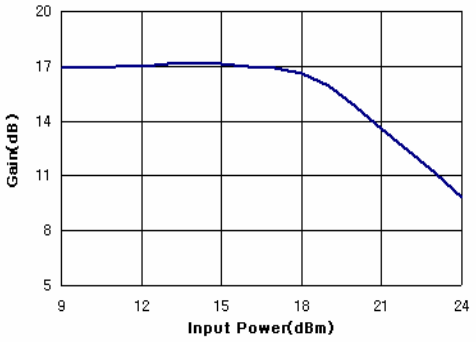
ACPR vs Output Channel Power
9ch Forward, ±885 offset, 30kHz Meas BW



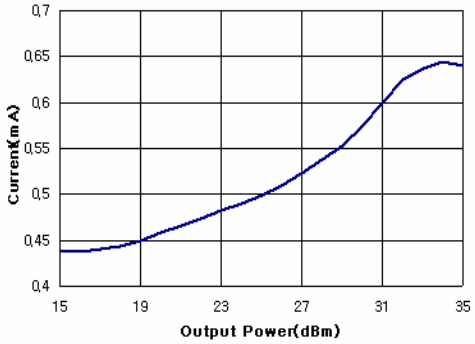
Noise Figure vs Frequency



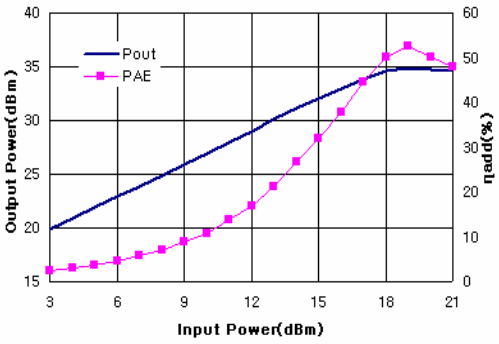
Gain vs Input Power



Current vs Output Power



Output Power, ηadd vs Input Power



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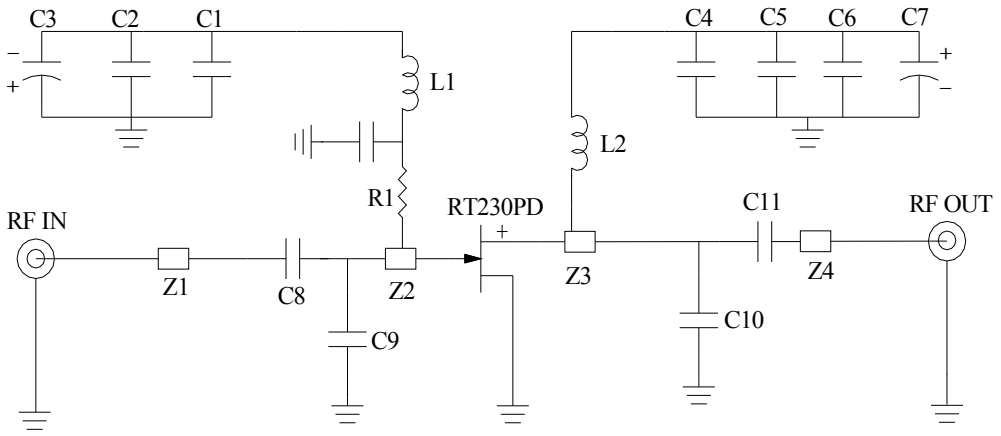
▪ Version 5.2

Application Circuit for RT230PD(1800 ~ 1900MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

Typical Specifications				
Frequency Range	**MHz**	**1700**	**1750**	**1800**
Gain	**dB**	**16.9**	**17**	**16.6**
Input Return Loss	**dB**	**-10**	**-22**	**-13**
Output P1dB	**dBm**		**34.5**	
Output IP3	**dBm**		**47**	
Noise Figure	**dB**		**2.5**	
Channel Power@ -45dBc ACPR	**dBm**		**27.5**	

Application Circuit (1800 ~ 1900MHz)



Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
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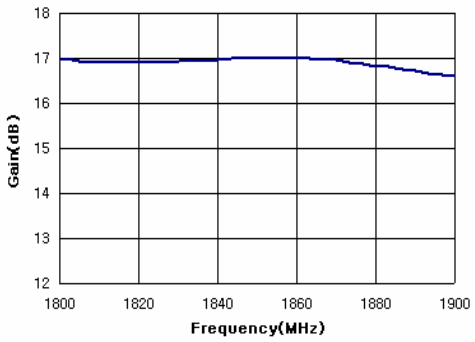
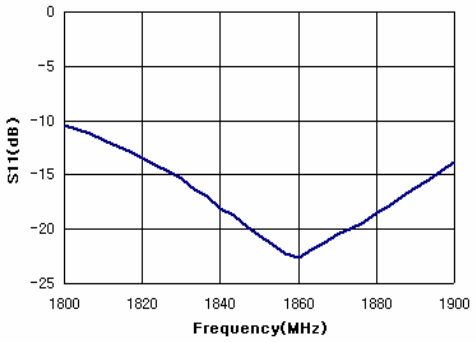
C1,C5	**1000pF**	**1608**	**L1**	**18nH**	**1608**
C2,C6	**0.1uF**	**1608**	**L2**	**18nH**	**2520**
C3,C7	**4.7uF**	**3216**	**Z1**	**W x L**	**1.4 x 7.0**
C8	**10pF**	**1608**	**Z2**		**1.4 x 2.0**
C9	**3.0pF**	**1608**	**Z3**		**1.4 x 2.0**
C10	**1.5pF**	**1608**	**Z4**		**1.4 x 7.0**
C11	**5pF**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

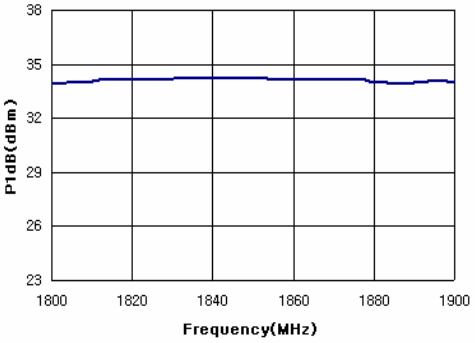
Gain vs Frequency



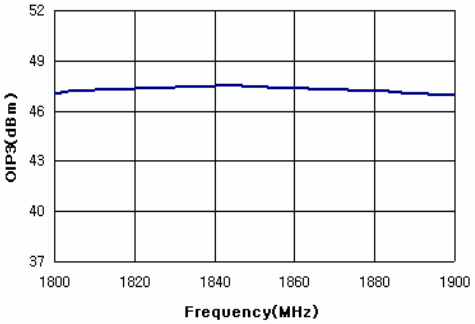
S11 vs Frequency



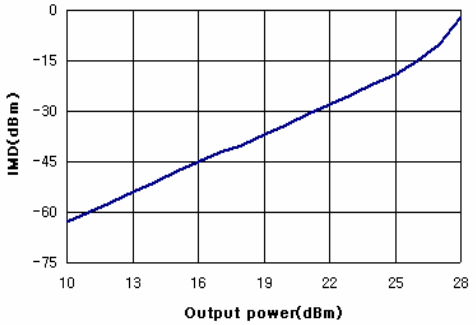
P1dB vs Frequency



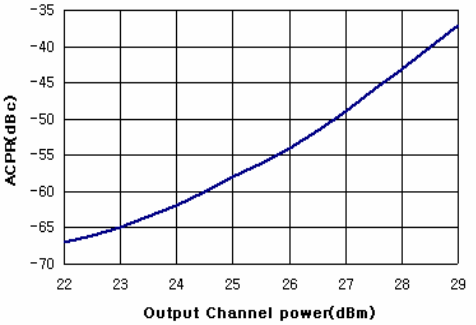
OIP3 vs Frequency
20dBm/tone separated by 1MHz



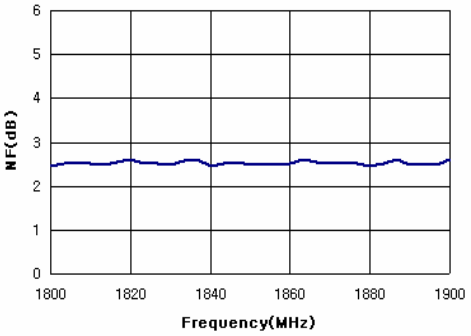
IMD vs Output Power
Fundamental Frequency=1860,1861MHz



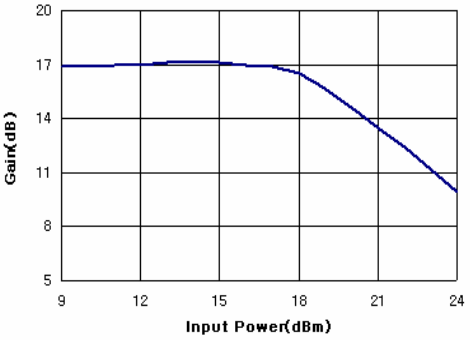
ACPR vs Output Channel Power
9ch Forward, ±885 offset, 30kHz Meas BW



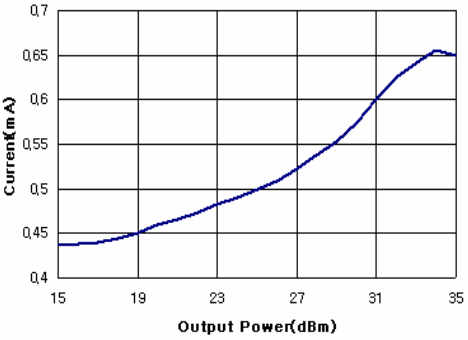
Noise Figure vs Frequency



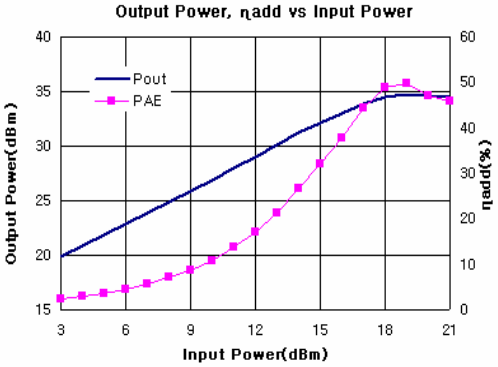
Gain vs Input Power



Current vs Output Power



Output Power, ηadd vs Input Power

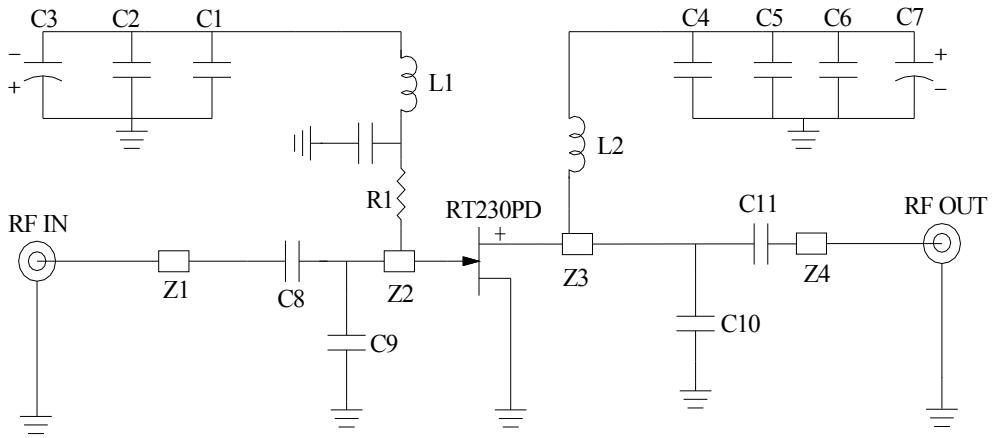


Application Circuit for RT230PD(1900 ~ 2000MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

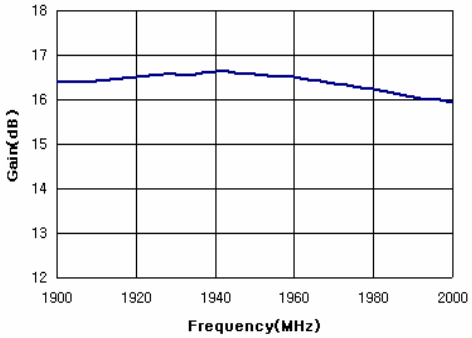
Typical Specifications				
Frequency Range	MHz	1900	1950	2000
Gain	dB	16.5	16.7	15.9
Input Return Loss	dB	-15	-24	-12
Output P1dB	dBm		34.5	
Output IP3	dBm		47	
Noise Figure	dB		2.5	
Channel Power@ -45dBc ACLR	dBm		25	

Application Circuit (1900 ~ 2000MHz)

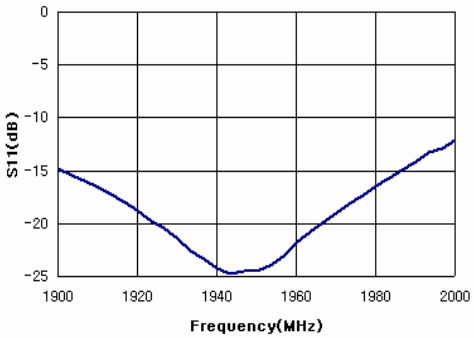


Bill of Material					
Text	Value	Size(mm)	Text	Value	Size(mm)
C4	100pF	1608	R1	51 Ω	1608
C1,C5	1000pF	1608	L1	18nH	1608
C2,C6	0.1uF	1608	L2	18nH	2520
C3,C7	4.7uF	3216	Z1	W x L	1.4 x 7.0
C8	10pF	1608	Z2		1.4 x 2.0
C9	2.7pF	1608	Z3		1.4 x 2.0
C10	1.5pF	1608	Z4		1.4 x 7.0
C11	5pF	1608	Circuit Board Material : FR4(ε_r=4.7), 0.8mm		

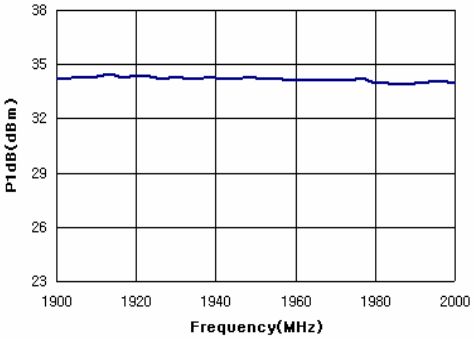
Gain vs Frequency



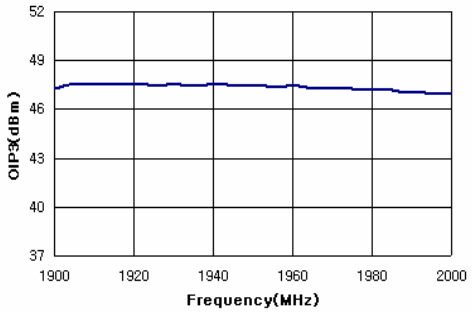
S11 vs Frequency



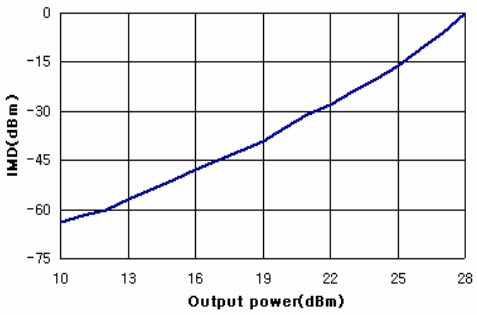
P1dB vs Frequency



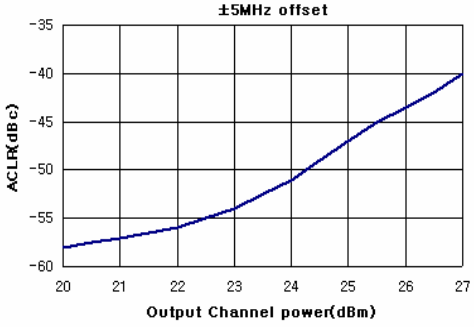
OIP3 vs Frequency
20dBm/tone separated by 1MHz



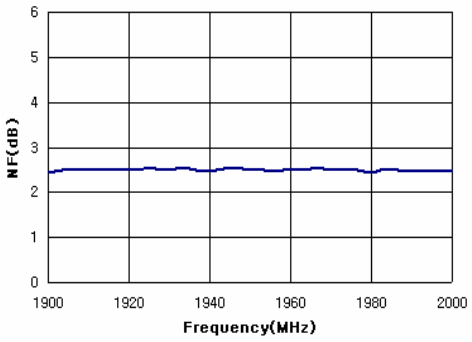
IMD vs Output Power
Fundamental Frequency=1860,1861MHz



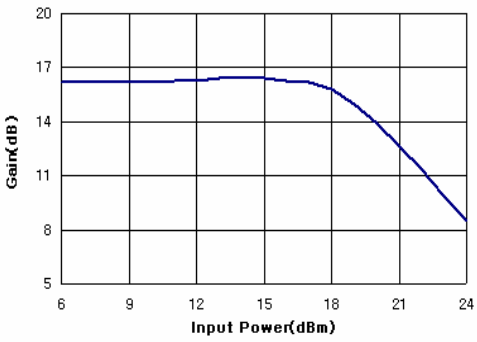
ACLR vs Output Channel Power
3GPP W-CDMA Test Model1 64DPCH,
±5MHz offset



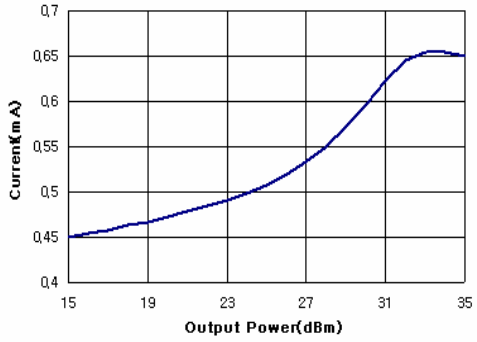
Noise Figure vs Frequency



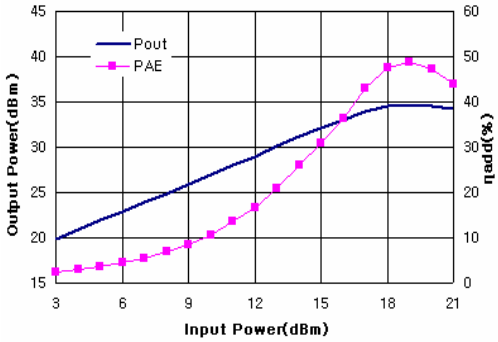
Gain vs Input Power



Current vs Output Power



Output Power, ηadd vs Input Power



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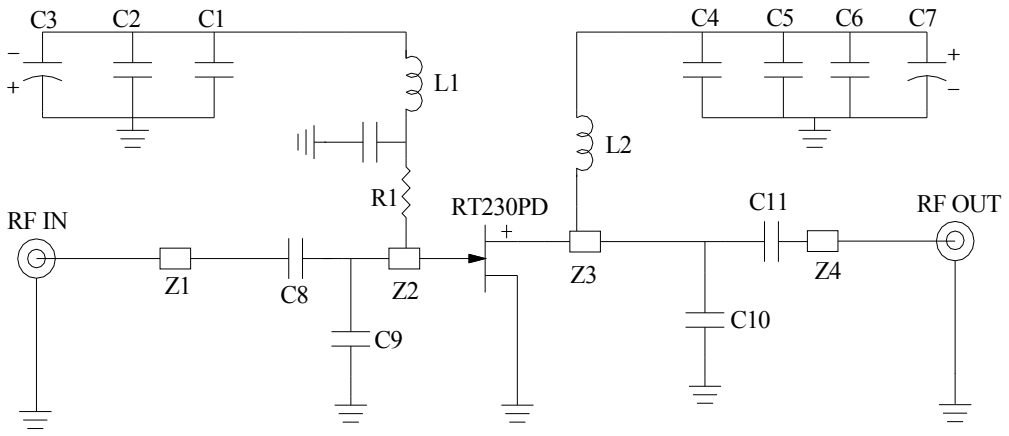
Application Circuit for RT230PD(2100 ~ 2200MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

Typical Specifications				
Frequency Range	**MHz**	**2100**	**2150**	**2200**
Gain	**dB**	**16.5**	**16.3**	**16.2**
Input Return Loss	**dB**	**-13**	**-15**	**-14**
Output P1dB	**dBm**		**34.5**	
Output IP3	**dBm**		**47**	
Noise Figure	**dB**		**2.5**	
Channel Power @ -45dBc ACLR	**dBm**		**25**	

Application Circuit (2100 ~ 2200MHz)



Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**R1**	**51 Ω**	**1608**
C1,C5	**1000pF**	**1608**	**L1**	**18nH**	**1608**
C2,C6	**0.1uF**	**1608**	**L2**	**18nH**	**2520**
C3,C7	**4.7uF**	**3216**	**Z1**	**W x L**	**1.4 x 7.0**
C8	**10pF**	**1608**	**Z2**		**1.4 x 2.0**
C9	**2.4pF**	**1608**	**Z3**		**1.4 x 2.0**
C10	**1.5pF**	**1608**	**Z4**		**1.4 x 7.0**
C11	**5pF**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

Power Transistor RT230PD

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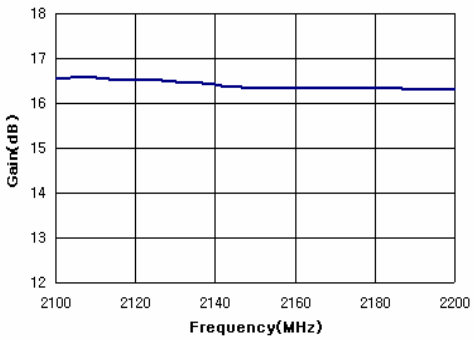
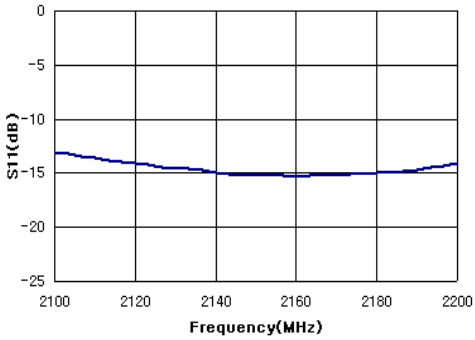
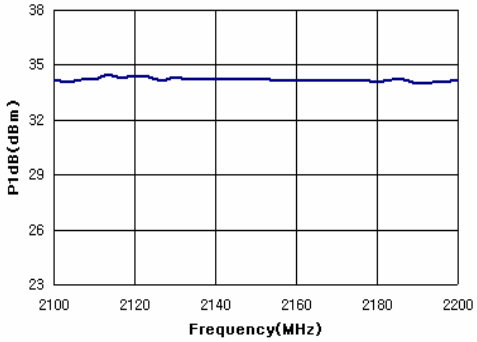
Gain vs Frequency



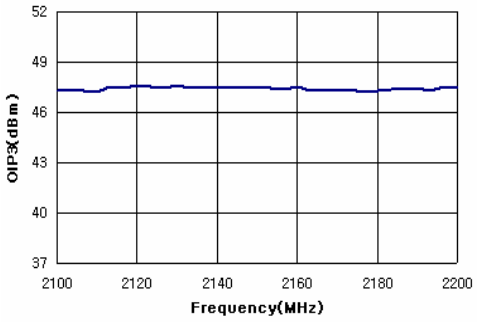
S11 vs Frequency



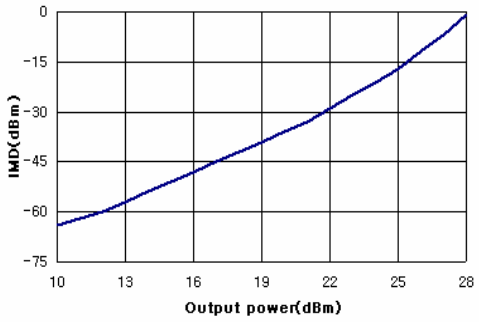
P1dB vs Frequency



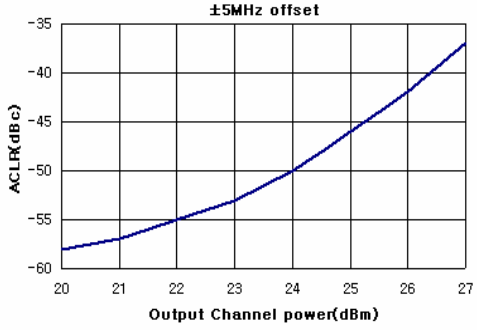
OIP3 vs Frequency
20dBm/tone separated by 1MHz



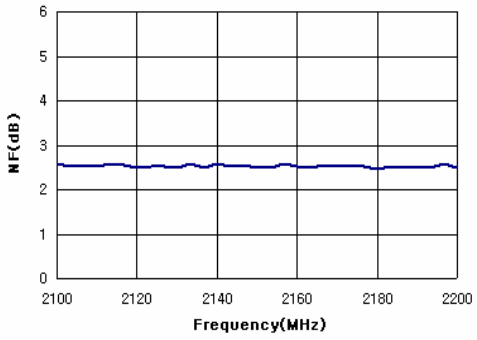
IMD vs Output Power
Fundamental Frequency=1860,1861MHz



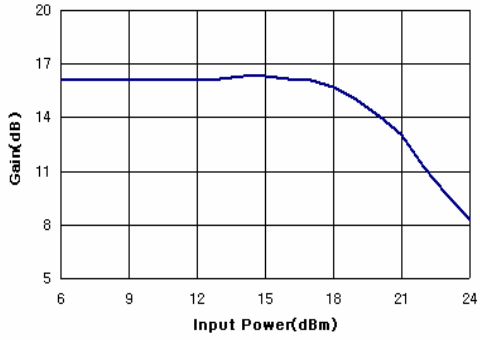
ACLR vs Output Channel Power
3GPP W-CDMA Test Model 1 64DPCH,
±5MHz offset



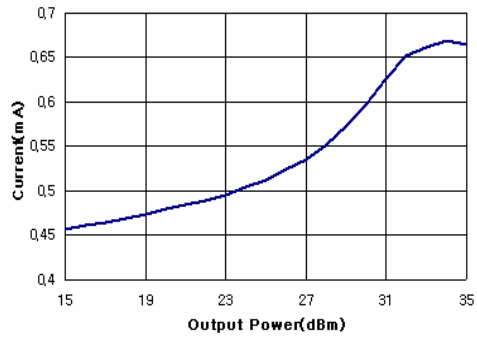
Noise Figure vs Frequency



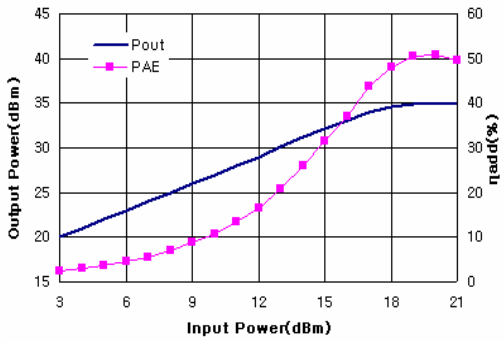
Gain vs Input Power



Current vs Output Power



Output Power, ηadd vs Input Power



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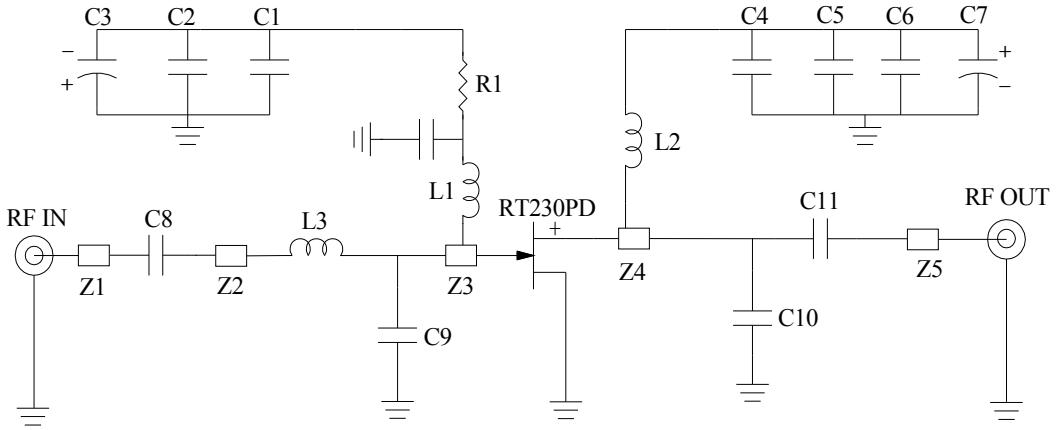
Application Circuit for RT230PD(2300 ~ 2400MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

Typical Specifications				
Frequency Range	MHz	2300	2350	2400
Gain	dB	15.2	15.5	15
Input Return Loss	dB	-10	-20	-10
Output P1dB	dBm		34.5	
Output IP3	dBm		47	
Noise Figure	dB		2.8	

Application Circuit (2300 ~ 2400MHz)



Bill of Material					
Text	Value	Size(mm)	Text	Value	Size(mm)
C4	100pF	1608	L1	18nH	1608
C1,C5	1000pF	1608	L2	18nH	2520
C2,C6	0.1uF	1608	L3	2.7nH	1608
C3,C7	4.7uF	3216	Z1	W × L	1.4 × 1.0
C8	10pF	1608	Z2		1.4 × 4.0
C9	2.2pF	1608	Z3		1.4 × 1.0
C10	1.5pF	1608	Z4		1.4 × 1.0
C11	5pF	1608	Z5		1.4 × 7.0
R1	51 Ω	1608	Circuit Board Material : FR4(ε_r=4.7), 0.8mm		

Power Transistor RT230PD

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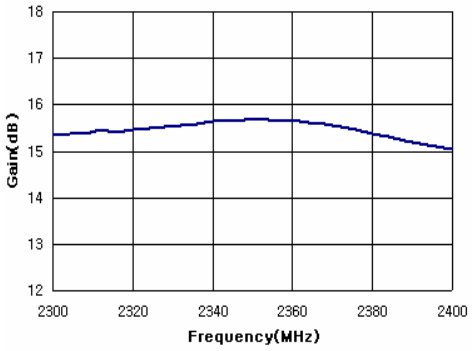
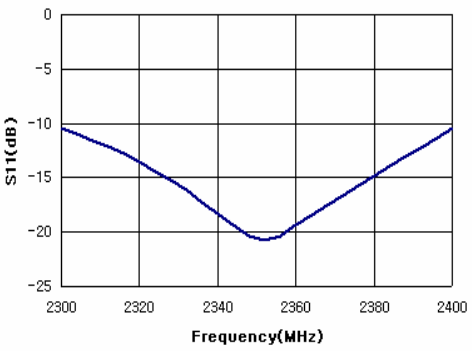
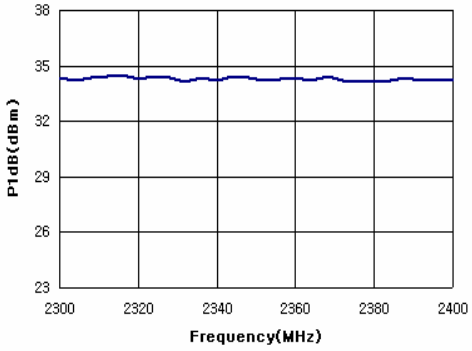
Gain vs Frequency



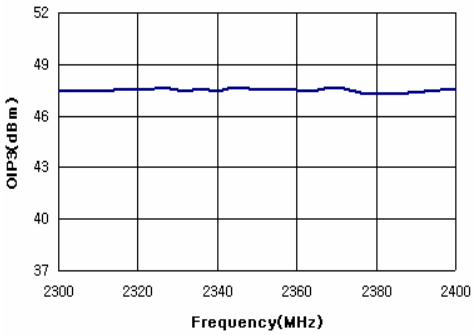
S11 vs Frequency



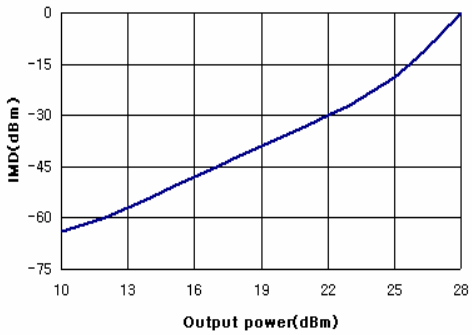
P1dB vs Frequency



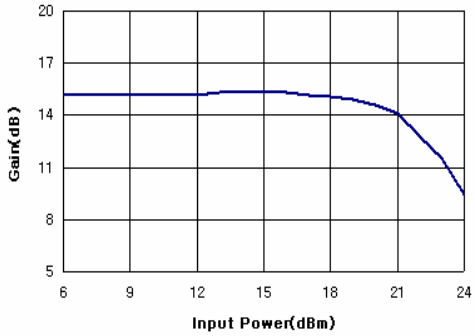
OIP3 vs Frequency
20dBm/tone separated by 1MHz



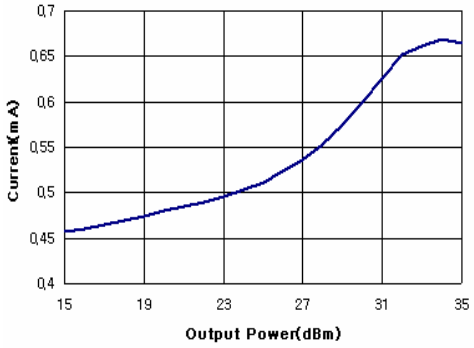
IMD vs Output Power
Fundamental Frequency=1860,1861MHz



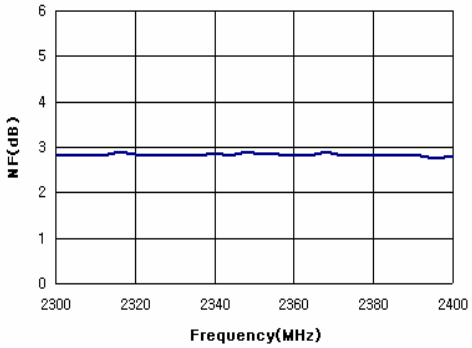
Gain vs Input Power



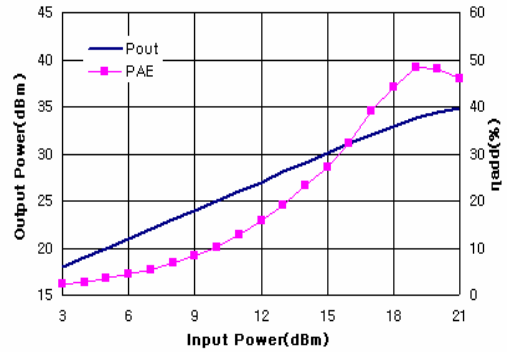
Current vs Output Power



Noise Figure vs Frequency



Output Power, ηadd vs Input Power



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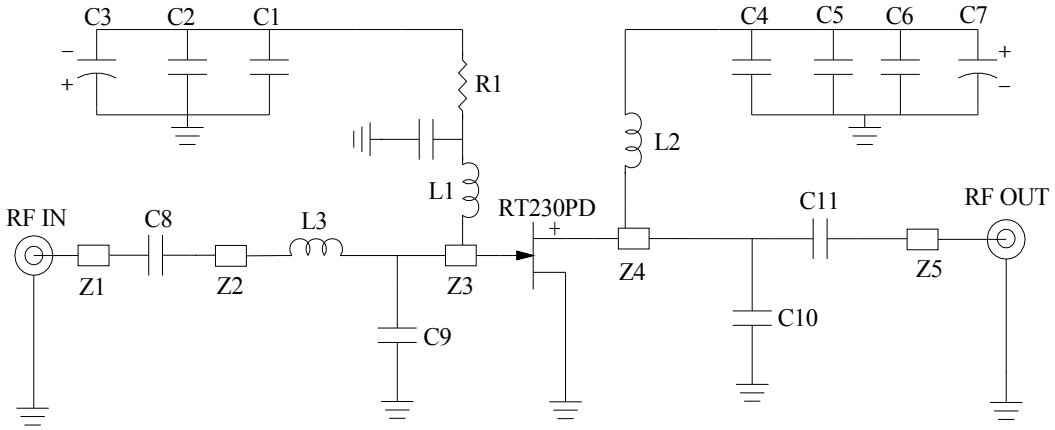
Application Circuit for RT230PD(2500 ~ 2700MHz)

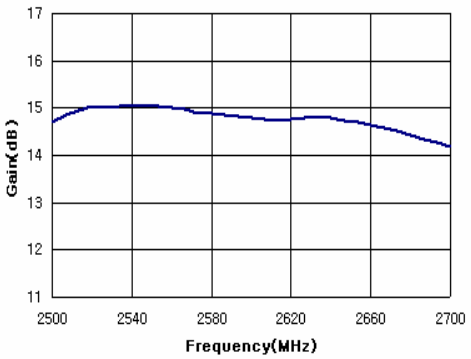
Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

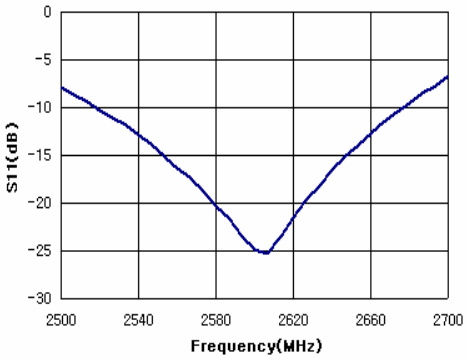
Typical Specifications				
Frequency Range	**MHz**	**2500**	**2600**	**2700**
Gain	**dB**	**14.7**	**14.7**	**14.2**
Input Return Loss	**dB**	**-7**	**-25**	**-7**
Output P1dB	**dBm**		**34**	
Output IP3	**dBm**		**47**	
Noise Figure	**dB**		**3.0**	

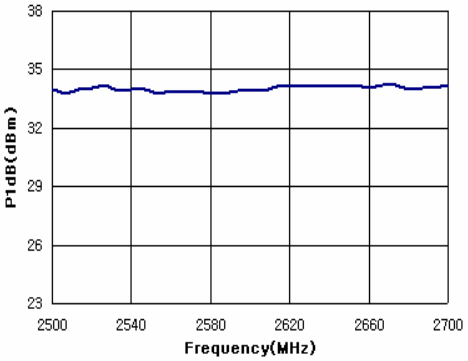
Application Circuit (2500 ~ 2700MHz)

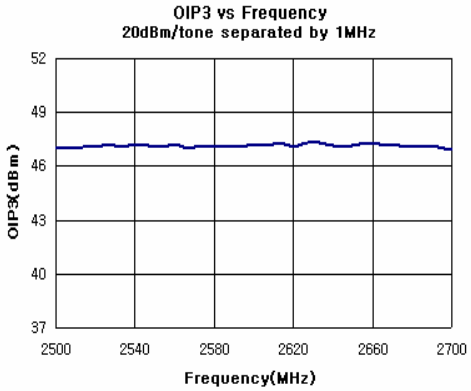


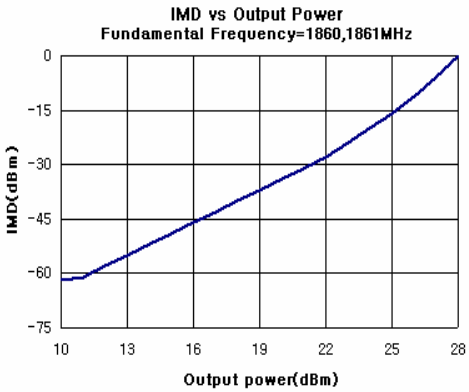
Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**L1**	**18nH**	**1608**
C1,C5	**1000pF**	**1608**	**L2**	**18nH**	**2520**
C2,C6	**0.1uF**	**1608**	**L3**	**2.7nH**	**1608**
C3,C7	**4.7uF**	**3216**	**Z1**	**W × L**	**1.4 × 1.0**
C8	**10pF**	**1608**	**Z2**		**1.4 × 4.0**
C9	**1.8pF**	**1608**	**Z3**		**1.4 × 1.0**
C10	**1.5pF**	**1608**	**Z4**		**1.4 × 1.0**
C11	**5pF**	**1608**	**Z5**		**1.4 × 7.0**
R1	**51 Ω**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

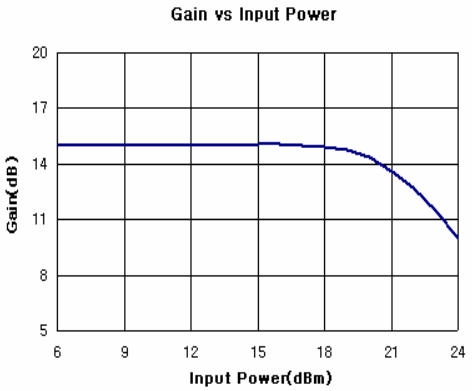

Gain(dB)
Frequency(MHz)

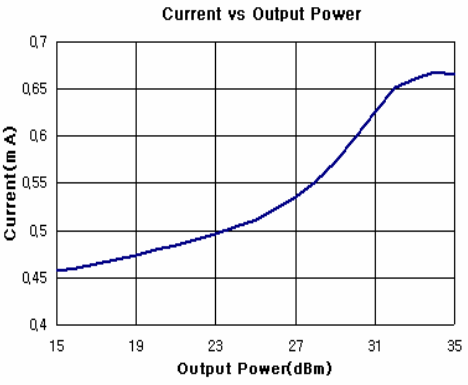

S11(dB)
Frequency(MHz)

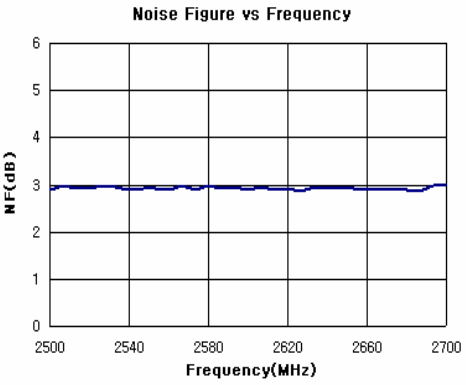

P1dB(dBm)
Frequency(MHz)

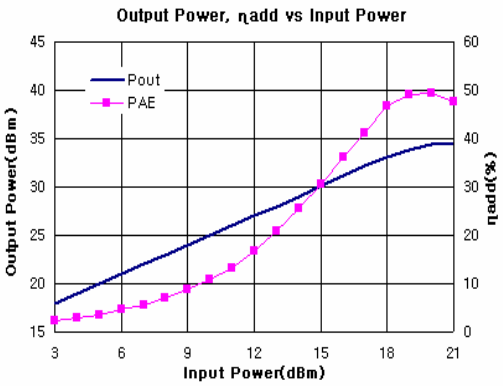

OIP3 vs Frequency
20dBm/tone separated by 1MHz
OIP3(dBm)
Frequency(MHz)


IMD vs Output Power
Fundamental Frequency=1860,1861MHz
IMD(dBm)
Output power(dBm)


Gain vs Input Power
Gain(dB)
Input Power(dBm)


Current vs Output Power
Current(mA)
Output Power(dBm)


Noise Figure vs Frequency
NF(dB)
Frequency(MHz)

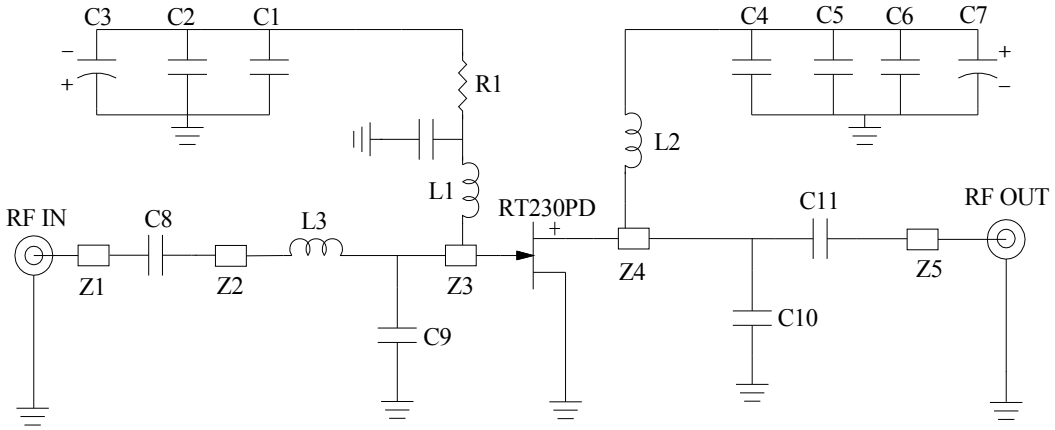

Output Power, ηadd vs Input Power
Pout
PAE
Output Power(dBm)
ηadd(%)
Input Power(dBm)

Application Circuit for RT230PD(3400 ~ 3600MHz)

Performance Charts (V_d=9V, I_d=450mA, Ta=25℃)

Typical Specifications				
Frequency Range	**MHz**	**3400**	**3500**	**3600**
Gain	**dB**	**11.9**	**12**	**11.9**
Input Return Loss	**dB**	**-7**	**-10**	**-7**
Output P1dB	**dBm**		**33**	
Output IP3	**dBm**		**46**	
Noise Figure	**dB**		**3.5**	

Application Circuit (3400 ~ 3600MHz)

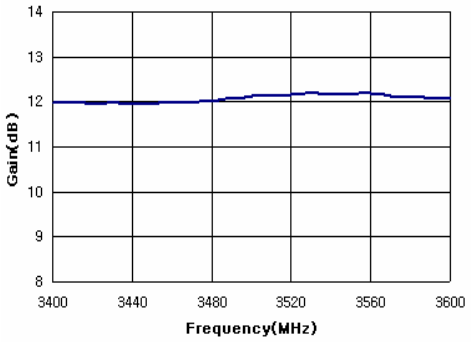


Bill of Material					
Text	**Value**	**Size(mm)**	**Text**	**Value**	**Size(mm)**
C4	**100pF**	**1608**	**L1**	**18nH**	**1608**
C1,C5	**1000pF**	**1608**	**L2**	**18nH**	**2520**
C2,C6	**0.1uF**	**1608**	**L3**	**1.5nH**	**1608**
C3,C7	**4.7uF**	**3216**	**Z1**	**W × L**	**1.4 × 1.0**
C8	**5pF**	**1608**	**Z2**		**1.4 × 4.0**
C9	**1.0pF**	**1608**	**Z3**		**1.4 × 1.0**
C10	**0.5pF**	**1608**	**Z4**		**1.4 × 1.0**
C11	**4pF**	**1608**	**Z5**		**1.4 × 7.0**
R1	**51 Ω**	**1608**	**Circuit Board Material : FR4(ε_r=4.7), 0.8mm**		

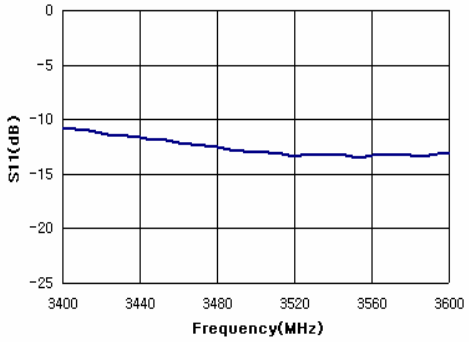
Power Transistor RT230PD

RFHIC

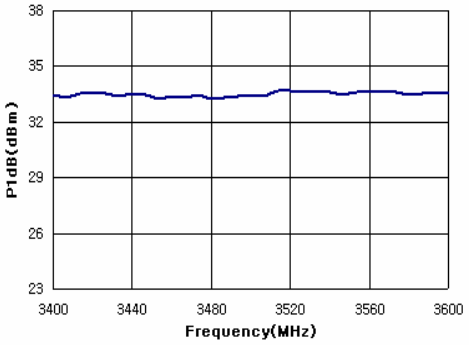
Gain vs Frequency



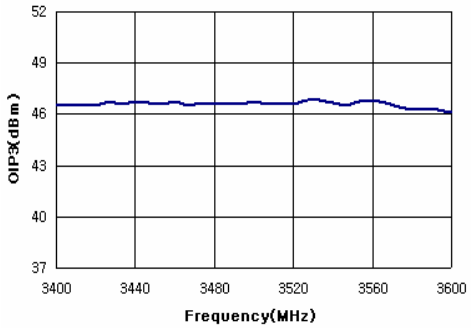
S11 vs Frequency



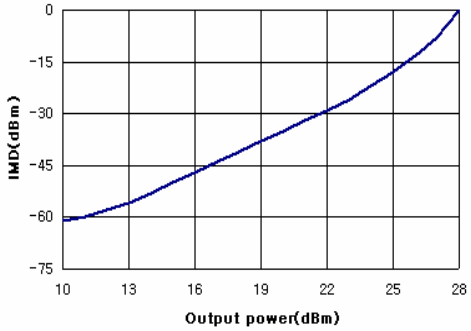
P1dB vs Frequency



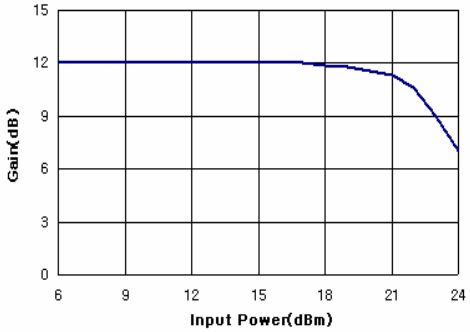
OIP3 vs Frequency
20dBm/tone separated by 1MHz



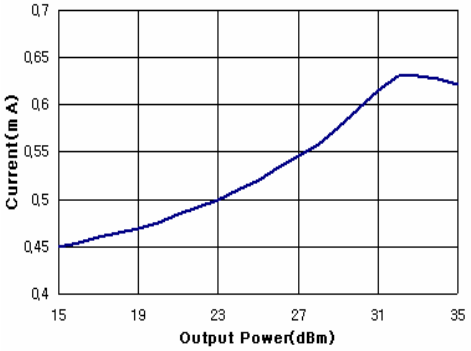
IMD vs Output Power
Fundamental Frequency=1860,1861MHz



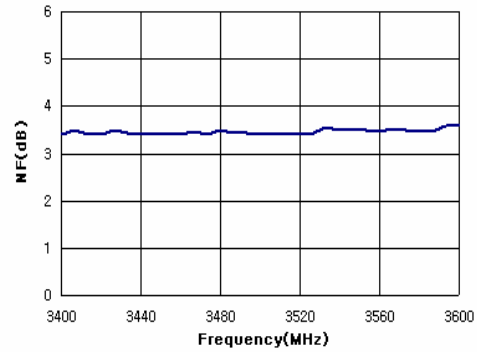
Gain vs Input Power



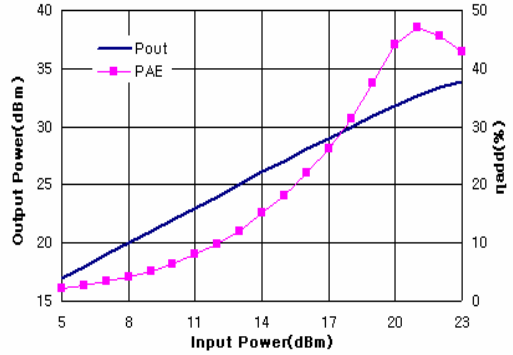
Current vs Output Power



Noise Figure vs Frequency



Output Power, ηadd vs Input Power



▪ Tel : 82-31-250-5011
▪ rfsales@rfhic.com

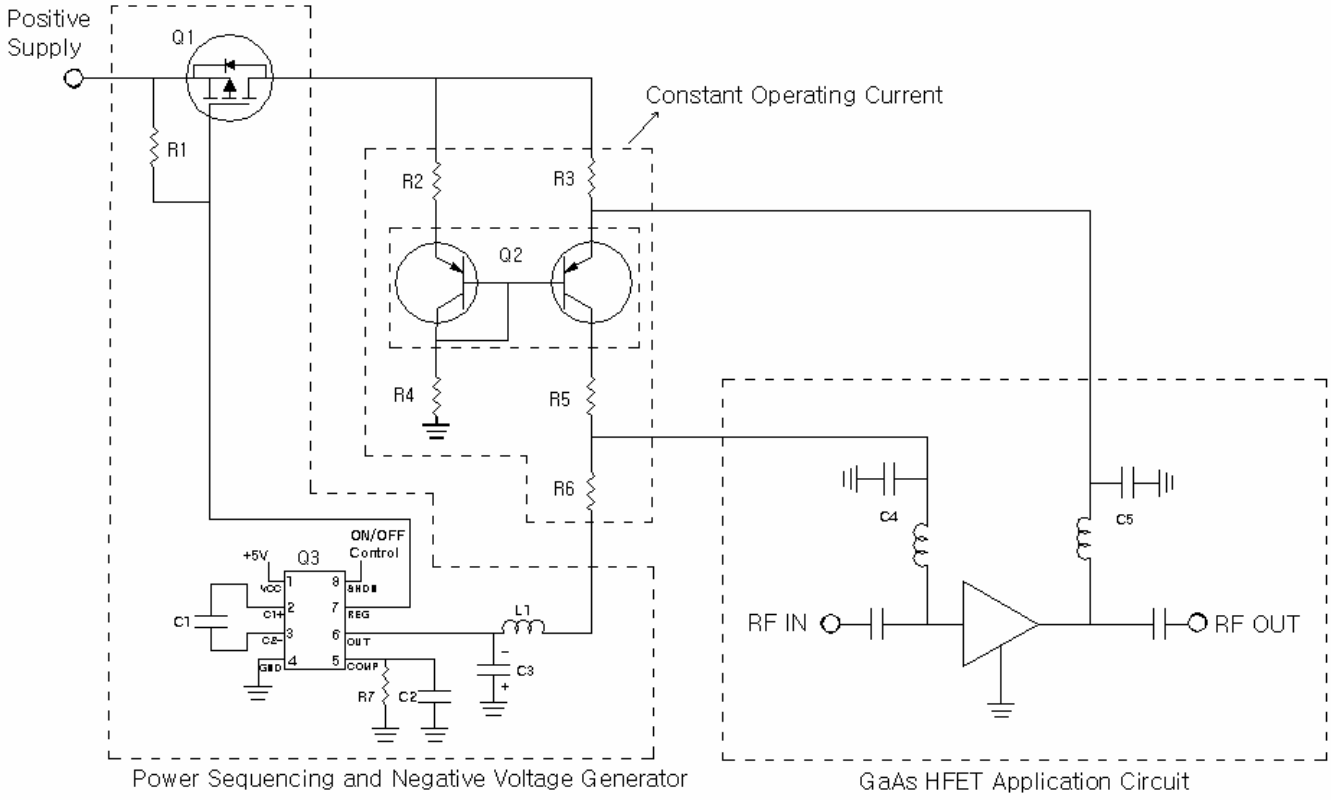
▪ Version 5.2

Biasing Circuits for GaAs HFET Power Amplifiers

This circuit below normally operates GaAs Power Amplifier and it is one of the circuits for stable operation and satisfactory performance. It is structured by the parts for constant current operation.

Main functions of this circuit :
Negative Voltage Generator
Power Sequencing mode(Negative before positive)
Constant operating current

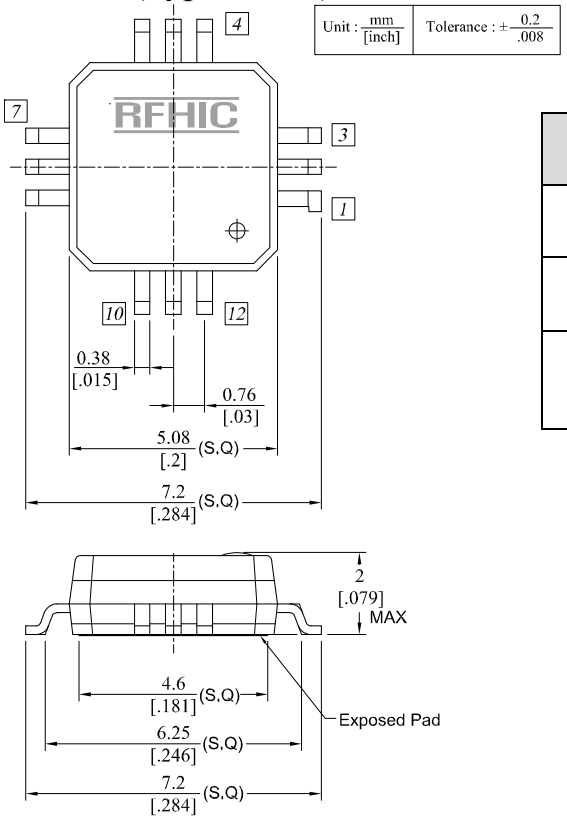
Constant operating current circuit is structured by low cost components. It will operate of constant current regardless of any temperature changes. R3 should carefully be taken by power dissipation.



Power Transistor RT230PD

PN	Value	Description	Maker	Quantity
Q1	N/A	P-channel MOSFET, IRLML5203	IRF	1
Q2	N/A	Dual PNP, UMT1N	Rohm	1
Q3	N/A	DC-DC Converter With Sequency mode, LTC1261	Linear Tech	1
R1	10kΩ	0603, 1/16W	Rohm	1
R2	24Ω	0603, 1/16W	Rohm	1
R3	0.5Ω	1206, 1 W	Rohm	1
R4	1.5KΩ	0603, 1/16W	Rohm	1
R5	1KΩ	0603, 1/16W	Rohm	1
R6	430Ω	0603, 1/16W	Rohm	1
R7	10kΩ	0603, 1/16W	Rohm	1
C1,C2	0.1uF	0603	Murata	1
C3,C4,C5	4.7uF	1206	Taiyo Yuden	3
L1	1uH	0805	Taiyo Yuden	1

Package Dimensions (Type:SP-12)



Function	Pin No.
Input	7, 8, 9
Output , Bias	1, 2, 3
Ground	4, 5, 6, 10, 11, 12 Backside Copper

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