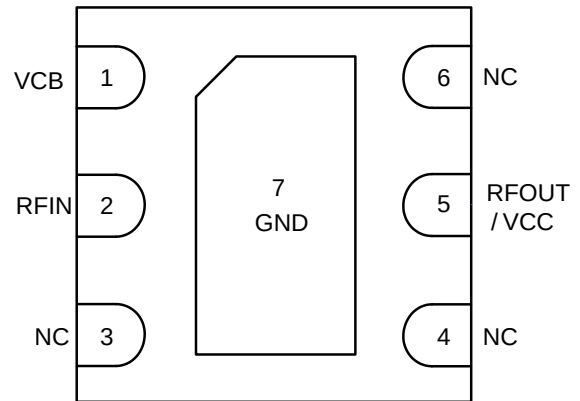


Features

- 1MHz to 6GHz operational
- Typical +30dBm P1dB
- 13.8dB Gain at 2140MHz
- Typical +45 dBm OIP3
- 5V typical supply, 160mA Current at VCB=3.75V
- ESD protection all ports above 1000V HBM
- Industry Standard DFN2x2-6L Package
- Linearity and thermal compensation with Integrated Active Bias Circuit



Functional Block Diagram

Applications

- | | |
|-----------------------------------|----------------------------|
| ■ Repeaters | ■ TDD / FDD System |
| ■ BTS High Power Amplifiers | ■ GSM / CDMA / PCS |
| ■ WCDMA / LTE | ■ ISM |
| ■ GPS / COMPASS / BDS / WALK TALK | ■ General Purpose Wireless |

Product Description

The AC401530 is an InGaP/GaAs MMIC linear amplifier targeted for use as a driver amplifier in wireless infrastructure where high linearity, medium power, and high efficiency are required. The AC401530 delivers high performance across a broad range of frequencies. At 2140MHz, the AC401530 typically provides 13.8dB of gain, 30.9dBm P1dB and 45dBm OIP3 while drawing 160mA quiescent current from a 5V supply. The AC401530 is assembled in an industry standard DFN2x2-6L package with internally integrated ESD protection unit.

Pin Description

Pin No.	Symbol	Description
1	VCB	Supply voltage for bias
2	RFIN	RF input
3,4,6	N/C	No Connection
5	RFOUT/ VCC	RF output and Supply voltage
7	GND	Ground

Notes: The Current, Gain and Linearity can be controlled by VCB.

Absolute Maximum Ratings

Parameter	Rating	Unit
Input RF Power	+22	dBm
Supply Voltage	8	V
Device Current	1000	mA
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C



Caution!

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Electrical Specifications

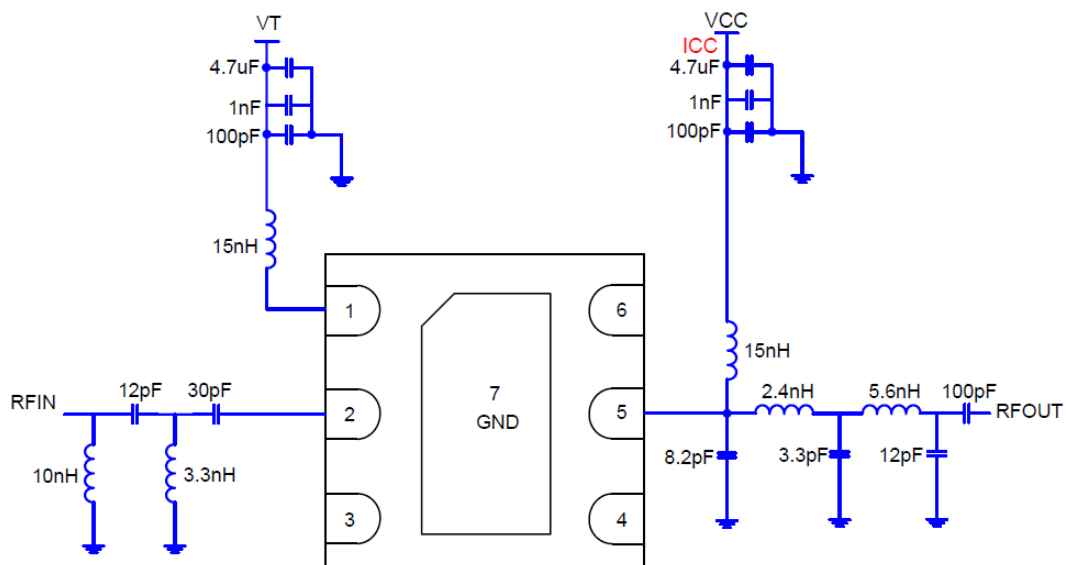
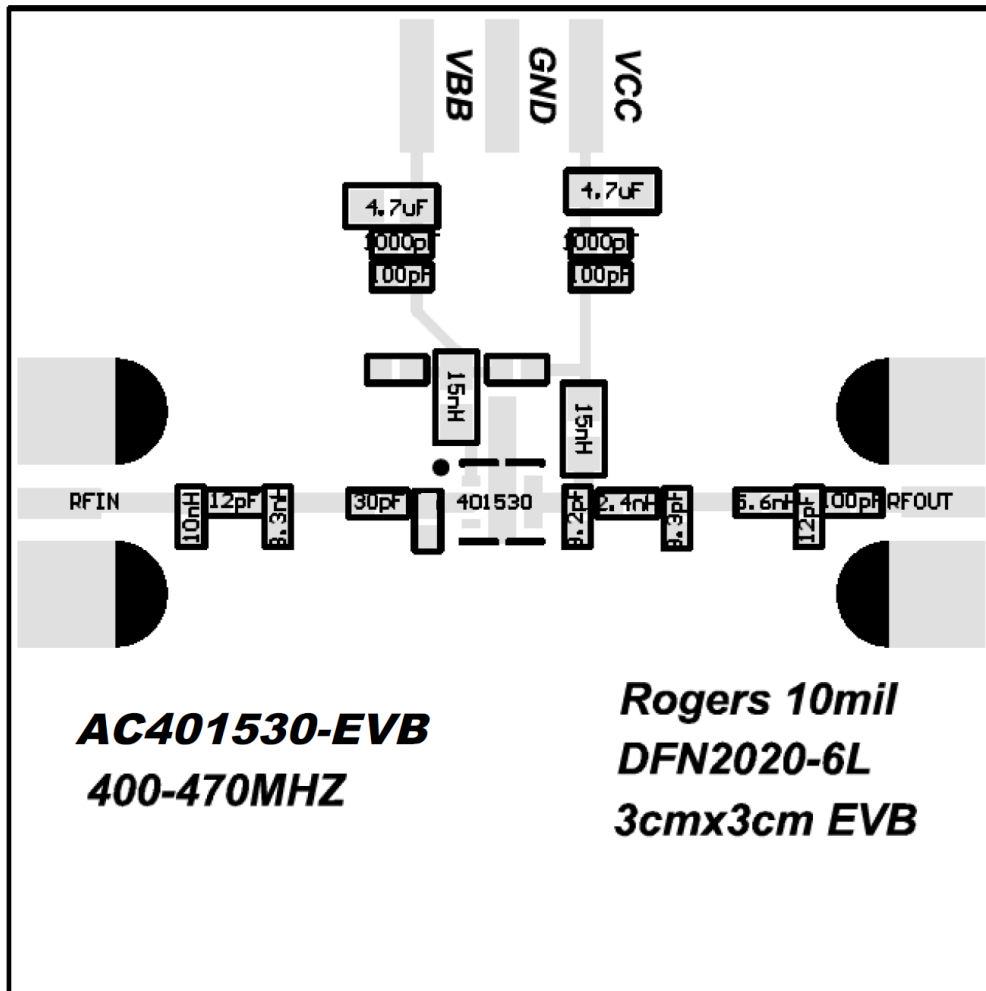
Parameter	Condition	Specification			Unit
		Min.	Typ.	Max.	
Operational Frequency Range		1		6000	MHz
Test Frequency			2140		MHz
Small Signal Gain			13.8		dB
P1dB Output Power			30.9		dBm
Input Return Loss			17.9		dB
Output Return Loss			17		dB
OIP3	Pout=15dBm/ tone, Δf = 1MHz		45		dBm
WCDA Channel power (at -50dBc ACLR)	3GPP WCDMA, TM1+64 DPCH, +5 MHz offset		20.9		dBm
Supply Voltage		3	5	6	V
Quiescent Current, Icq	VCC=5V, VCB=3.75V		160		mA

Device Quiescent Current (Icq) vs. VCB at VCC=5V

VCB (V)	3	3.2	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5
Icq (mA)	75	99	123	144	165	184	202	219	234	249	262

Reference Evaluation Board

400MHz~470MHz Application

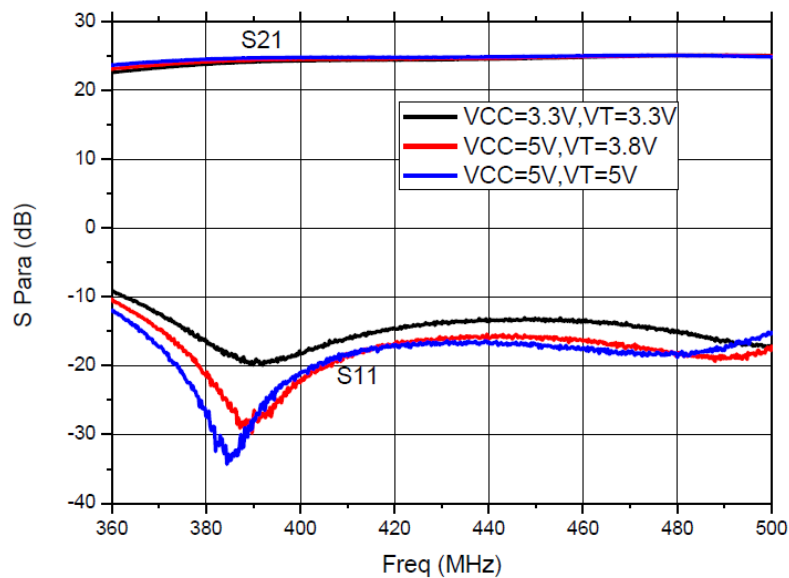


Typical performance on EVB

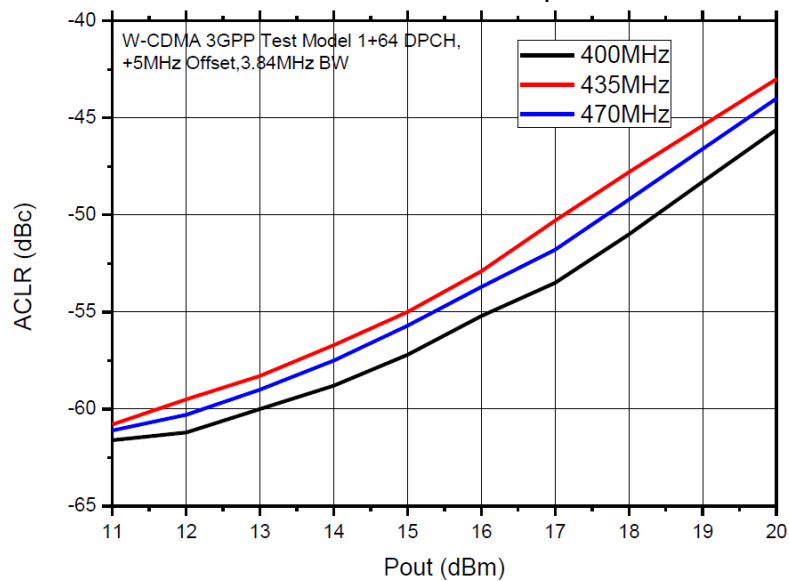
Typical Performance at +25 °C	(MHz)	400	435	470
Small Signal Gain	dB	24.6	24.6	25.0
Input Return Loss	dB	-22.5	-15.9	-17.2
P1dB	dBm	29.3	29.0	29.4
P3dB	dBm	30.5	31.0	30.3
Supply Voltage, Vcc	V	5 (VT=3.8V)		
Quiescent Collector Current, Idq	mA	164		

Performance plots

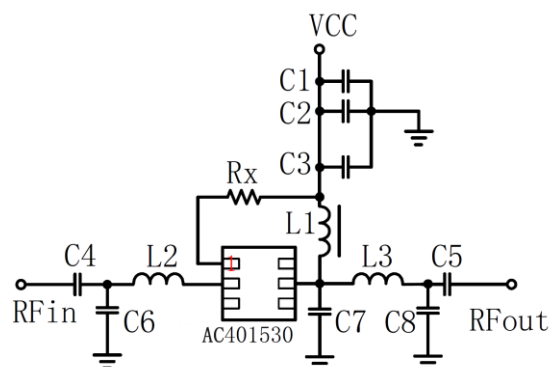
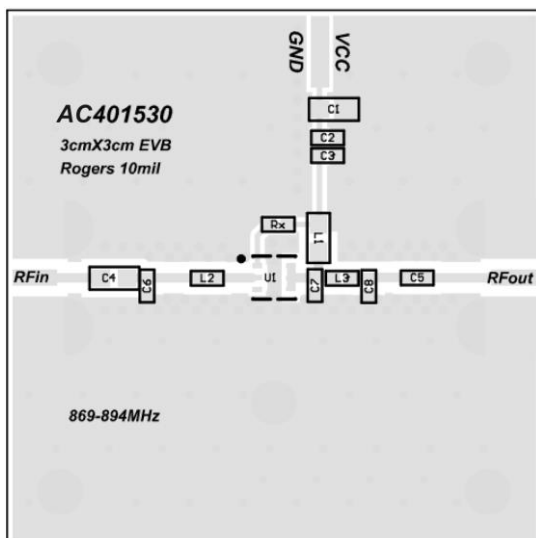
Small Signal S Parameters vs. Freq.



ACLR vs. Pout vs. Freq.



869MHz~894MHz Application



Notes: Use a divided resistor RX to replace the function of VCB.

Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innegration	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	3.9pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C6	7.5pF	CAP, SMD, 0402	various	
C7	2.7pF	CAP, SMD, 0402	various	
C8	6.3pF	CAP, SMD, 0402	various	
L1	9.5nH	Coli IND, SMD, 0603	TDK	
L2	1.2nH	IND, SMD, 0402	various	
L3	3.3nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

Critical component placement locations

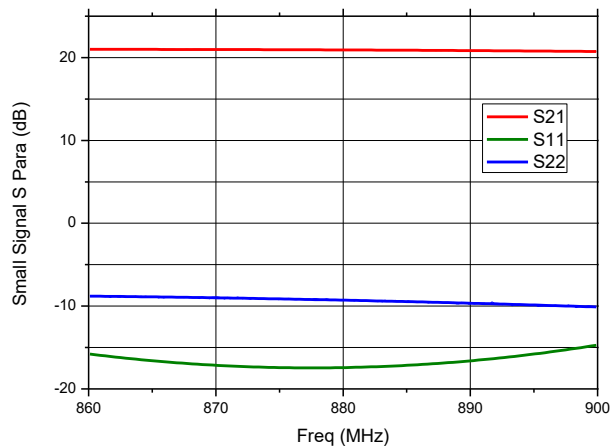
Distance from U1 Pin2 Pad (left edge) to L2 (right edge): 70mil
 Distance from L2 (left edge) to C6 (right edge): 91mil
 Distance from C6 (left edge) to C4 (right edge): 0mil
 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to L3 (left edge): 16mil
 Distance from L3 (right edge) to C8 (left edge): 16mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

Typical performance on EVB

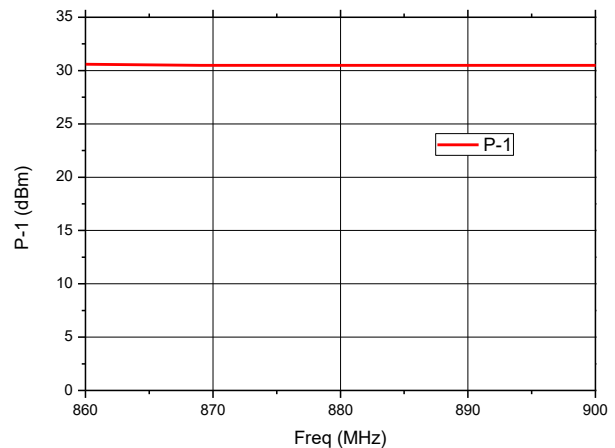
Typical Performance at +25 °C		(MHz)	869	881.5	894
Small Signal Gain	dB		21	20.9	20.8
Input Return Loss	dB		-16.8	-17.9	-16
Output Return Loss	dB		-9	-9.4	-9.8
P1dB	dBm		30.5	30.5	30.5
OIP3 (+19dBm/tone, $\Delta f=1\text{MHz}$)	dBm		45.3	45.5	45.8
WCDMA Channel power (at -50dBc ACLR)	dBm		20.5	20.4	20.3
Efficiency at Pout=30dBm	%		51.28	52.22	53.33
Supply Voltage, Vcc	V		5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA		160		

Performance plots

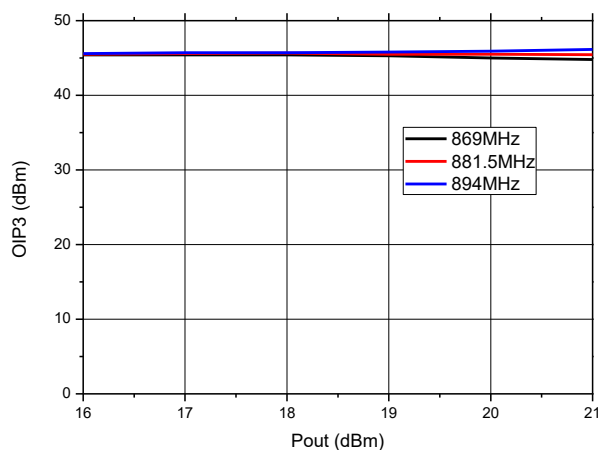
Small Signal S Parameters vs. Freq.



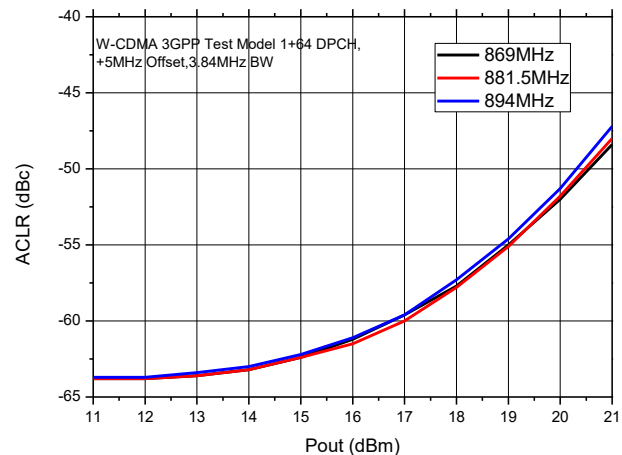
P1dB vs. Freq.



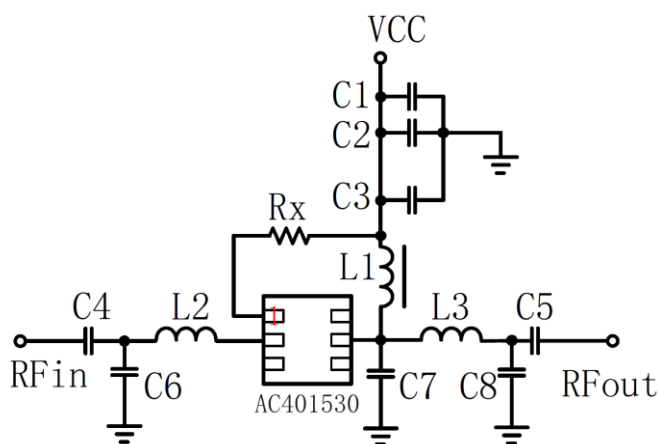
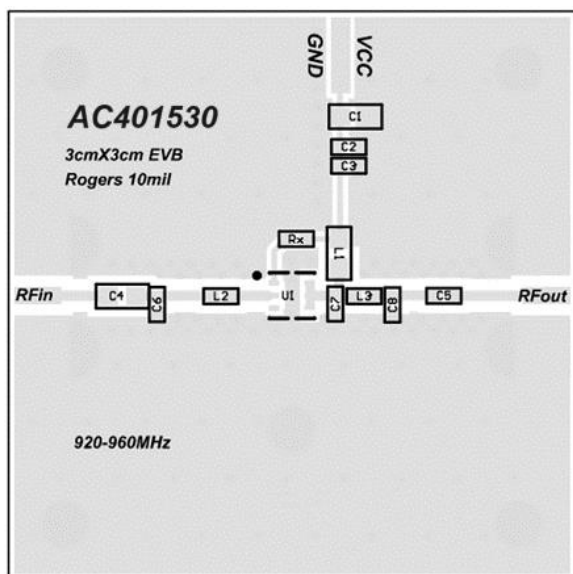
OIP3 vs. Pout/tone vs. Freq.



ACLR vs. Pout vs. Freq.



920MHz~960MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innegration	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	3.9pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C6	5.6pF	CAP, SMD, 0402	various	
C7	2.4pF	CAP, SMD, 0402	various	
C8	5pF	CAP, SMD, 0402	various	
L1	9.5nH	Coli IND, SMD, 0603	TDK	
L2	1.2nH	IND, SMD, 0402	various	
L3	3.3nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

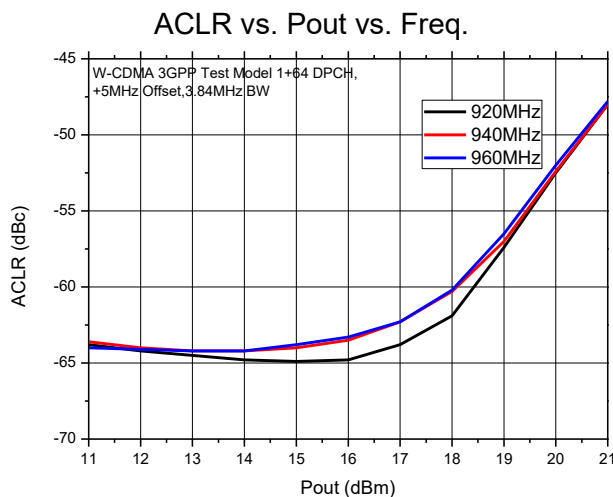
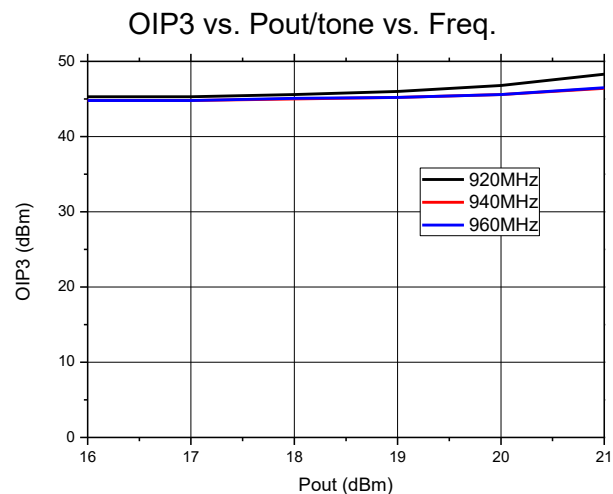
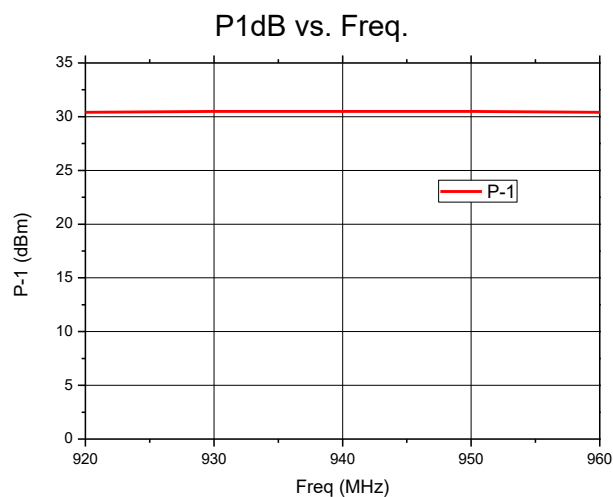
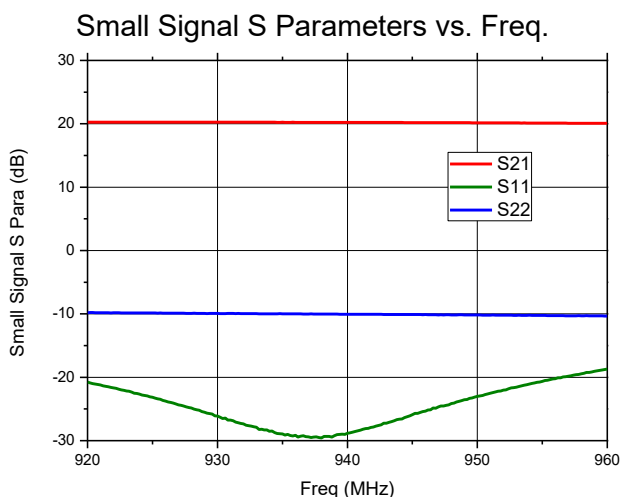
Critical component placement locations

Distance from U1 Pin2 Pad (left edge) to L2 (right edge): 70mil
 Distance from L2 (left edge) to C6 (right edge): 91mil
 Distance from C6 (left edge) to C4 (right edge): 0mil
 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to L3 (left edge): 16mil
 Distance from L3 (right edge) to C8 (left edge): 16mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

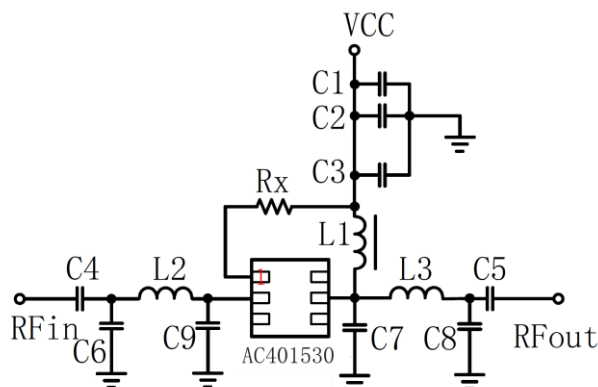
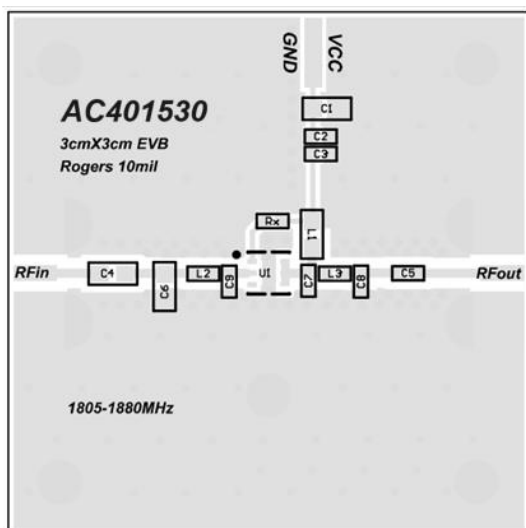
Typical performance on EVB

Typical Performance at +25 °C	(MHz)	920	940	960
Small Signal Gain	dB	20.3	20.2	20.1
Input Return Loss	dB	-20.8	-28.8	-18.7
Output Return Loss	dB	-9.8	-10	-10.3
P1dB	dBm	30.4	30.5	30.4
OIP3 (+19dBm/tone, $\Delta f=1$ MHz)	dBm	46	45.2	45.2
WCDMA Channel power (at -50dBc ACLR)	dBm	20.5	20.5	20.3
Efficiency at Pout=30dBm	%	53.6	52.5	52.8
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



1805MHz~1880MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innegration	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	1pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C6	1.4pF	CAP, SMD, 0603	Dalicap	
C7	4pF	CAP, SMD, 0402	various	
C8	1.8pF	CAP, SMD, 0402	various	
C9	1pF	CAP, SMD, 0402	various	
L1	9.5nH	Coli IND, SMD, 0603	TDK	
L2	0.8nH	IND, SMD, 0402	various	
L3	1.5nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

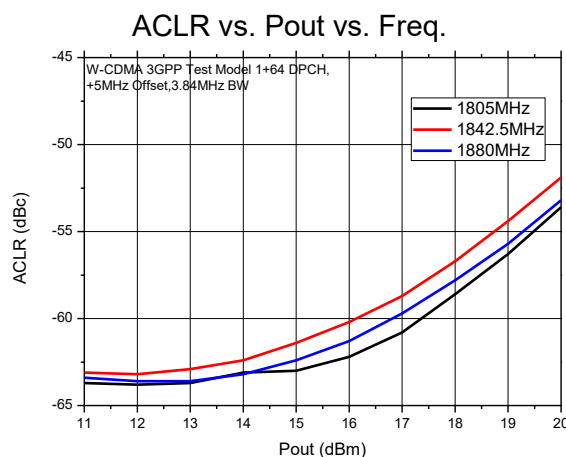
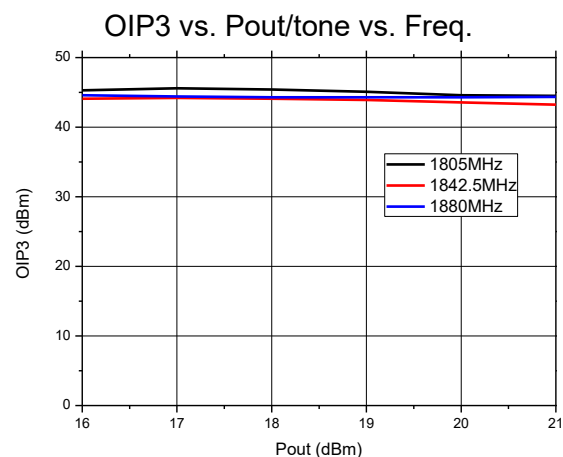
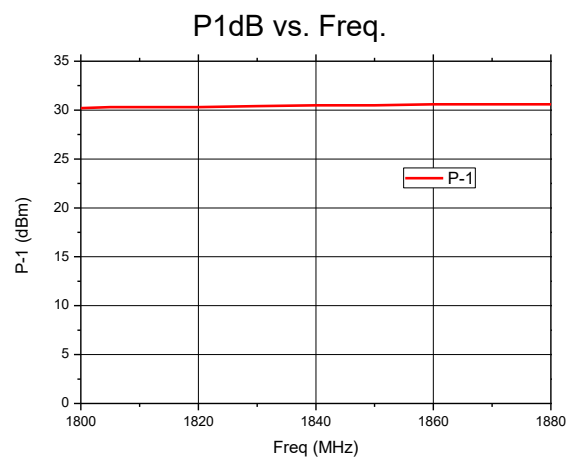
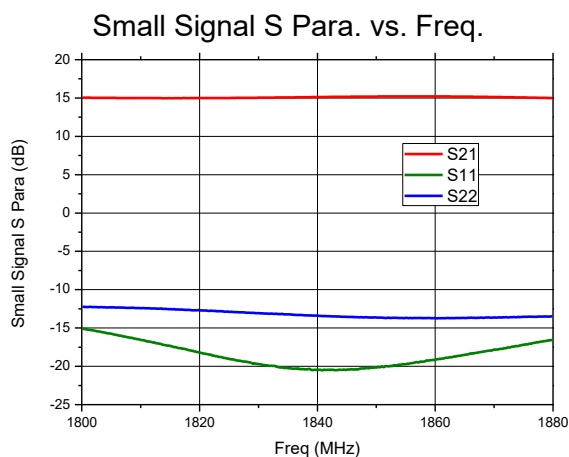
Critical component placement locations

Distance from U1 Pin2 Pad (left edge) to C9 (right edge): 30mil
 Distance from C9 (left edge) to L2 (right edge): 15mil
 Distance from L2 (left edge) to C6 (right edge): 39.4mil
 Distance from C6 (left edge) to C4 (right edge): 33.5mil
 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to L3 (left edge): 16mil
 Distance from L3 (right edge) to C8 (left edge): 16mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

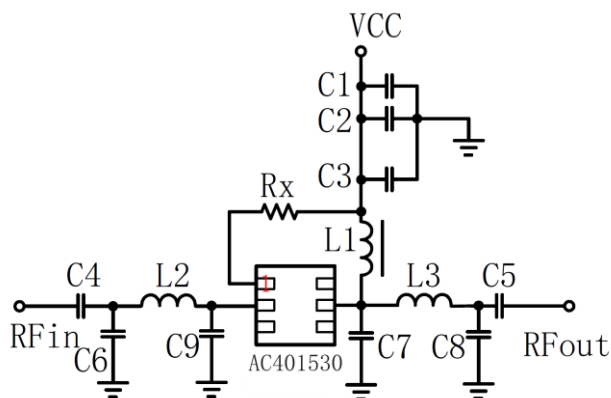
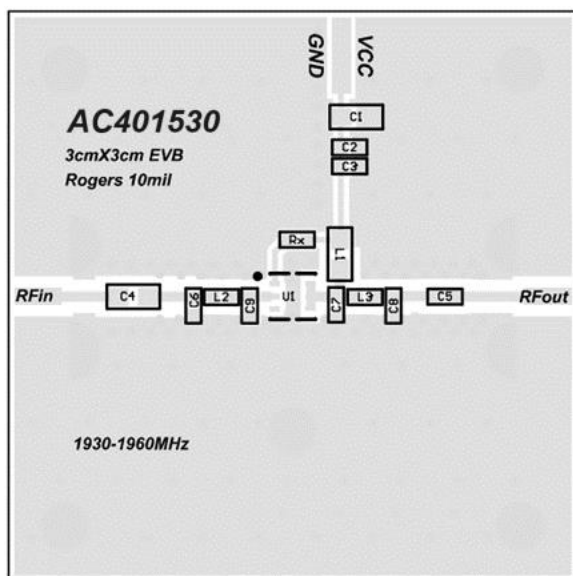
Typical performance on EVB

Typical Performance at +25 °C	(MHz)	1805	1842.5	1880
Small Signal Gain	dB	15.0	15.1	15.0
Input Return Loss	dB	-15.8	-20.5	-16.6
Output Return Loss	dB	-12.3	-13.5	-13.5
P1dB	dBm	30.3	30.5	30.6
OIP3 (+17dBm/tone, $\Delta f=1\text{MHz}$)	dBm	45.6	44.2	44.4
WCDMA Channel power (at -50dBc ACLR)	dBm	21	20.7	21.1
Efficiency at Pout=30dBm	%	48.2	48.6	49.1
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



1930MHz~1960MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innegration	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	1.2pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C6	0.1pF	CAP, SMD, 0402	various	
C7	2pF	CAP, SMD, 0402	various	
C8	2pF	CAP, SMD, 0402	various	
C9	3.3pF	CAP, SMD, 0402	various	
L1	9.5nH	Coli IND, SMD, 0603	TDK	
L2	0.8nH	IND, SMD, 0402	various	
L3	0.8nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

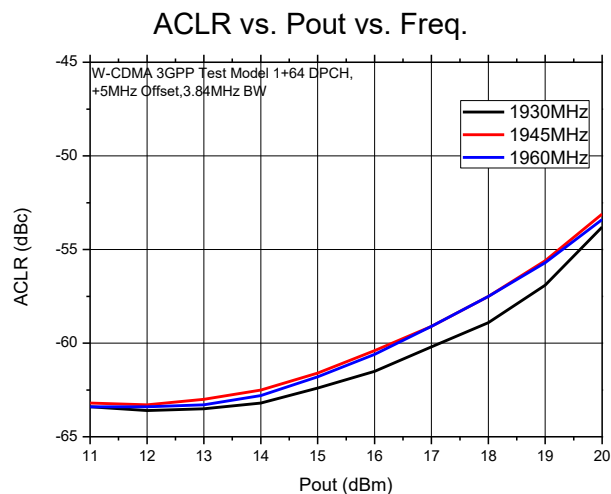
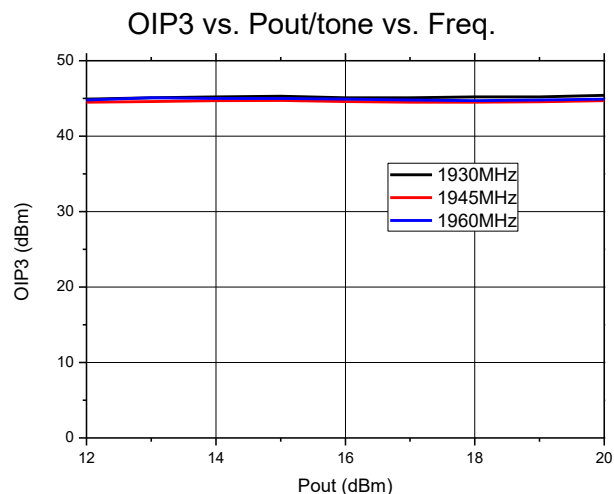
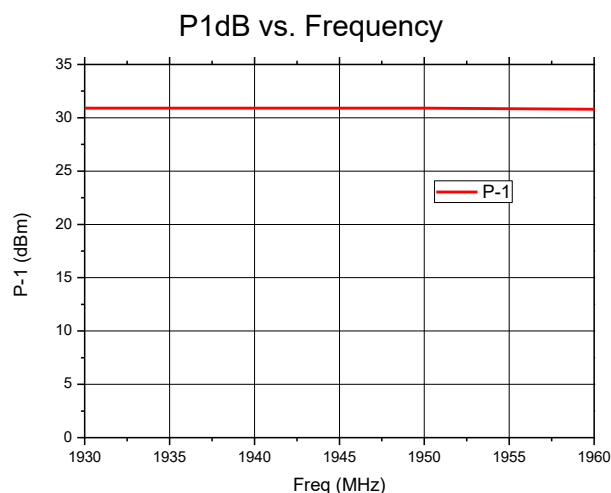
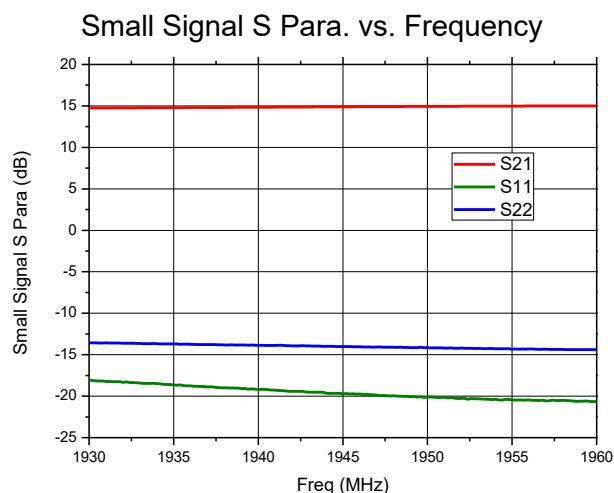
Critical component placement locations

Distance from U1 Pin2 Pad (left edge) to C9 (right edge): 30mil
 Distance from C9 (left edge) to L2 (right edge): 15mil
 Distance from L2 (left edge) to C6 (right edge): 15mil
 Distance from C6 (left edge) to C4 (right edge): 63mil
 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to L3 (left edge): 16mil
 Distance from L3 (right edge) to C8 (left edge): 16mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

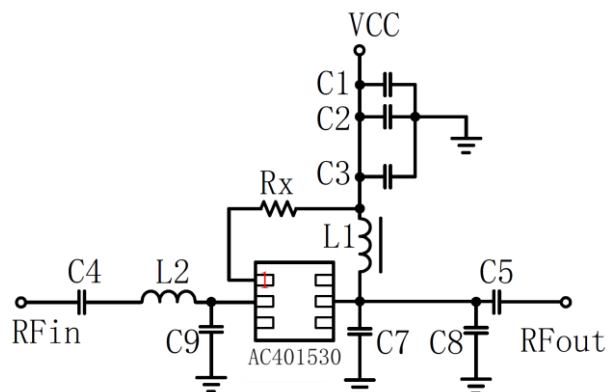
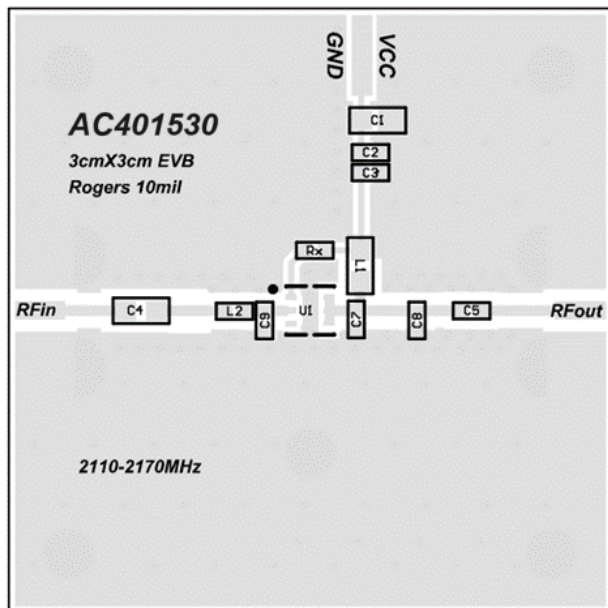
Typical performance on EVB

Typical Performance at +25 °C	(MHz)	1930	1945	1960
Small Signal Gain	dB	14.8	14.9	15.0
Input Return Loss	dB	-18.1	-19.7	-20.6
Output Return Loss	dB	-13.6	-14.0	-14.4
P1dB	dBm	30.9	30.9	30.8
OIP3 (+16dBm/tone, $\Delta f=1\text{MHz}$)	dBm	45.1	44.5	44.8
WCDMA Channel power (at -50dBc ACLR)	dBm	21	21	21
Efficiency at Pout=30dBm	%	48.9	48.9	48.54
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



2110MHz~2170MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innogrations	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	1pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C7	1.8pF	CAP, SMD, 0402	various	
C8	2pF	CAP, SMD, 0402	various	
C9	2.7pF	CAP, SMD, 0402	various	
L1	4.3nH	Coli IND, SMD, 0603	TDK	
L2	0.8nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

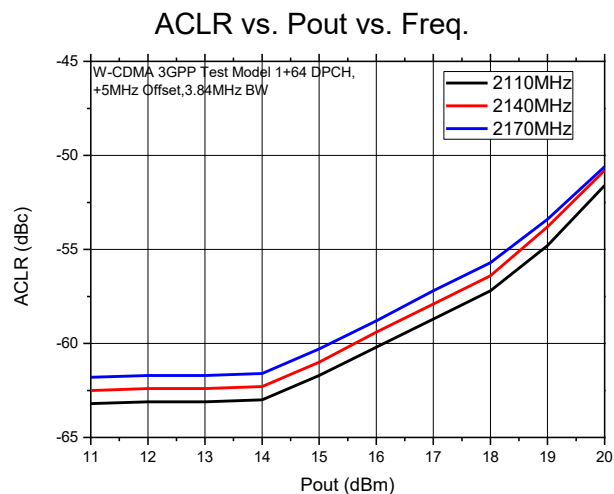
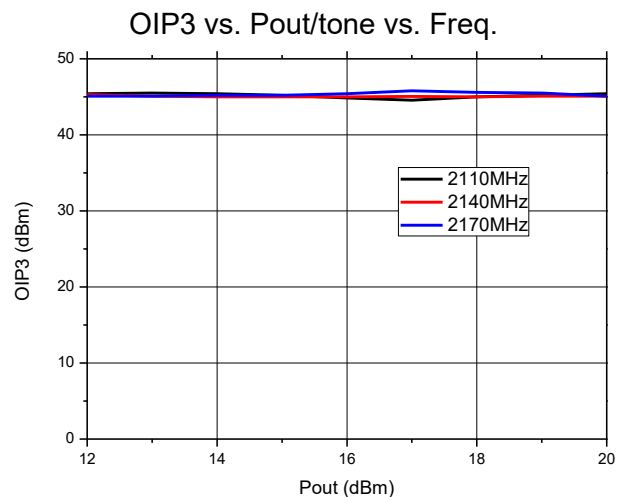
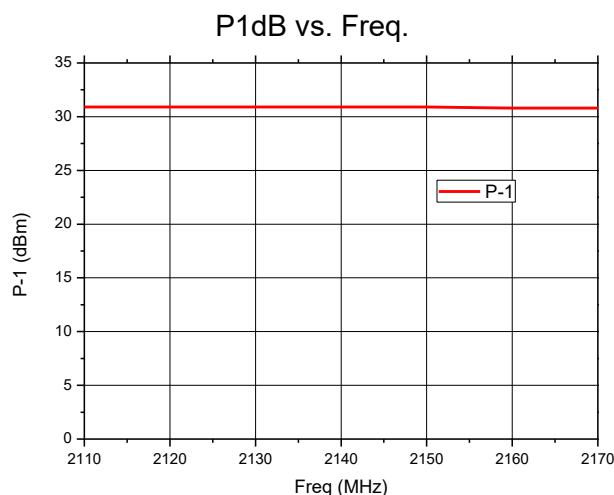
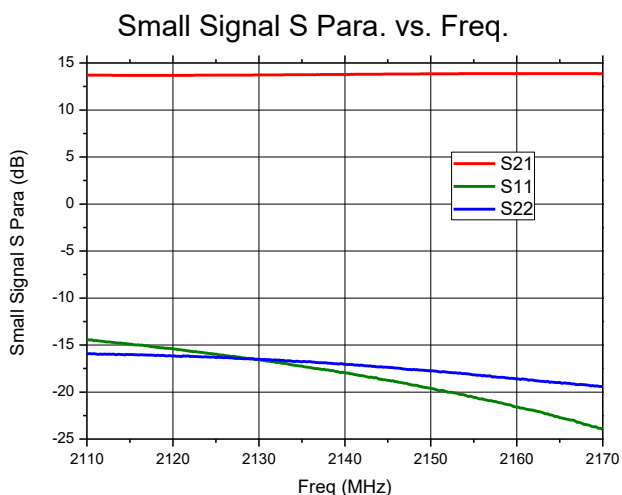
Critical component placement locations

Distance from U1 Pin2 Pad (left edge) to C9 (right edge): 30mil
 Distance from C9 (left edge) to L2 (right edge): 15mil
 Distance from L2 (left edge) to C4 (right edge): 103.5mil
 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to C8 (left edge): 93.5mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

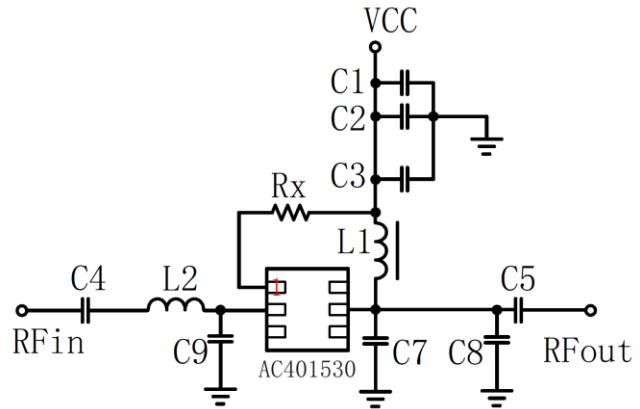
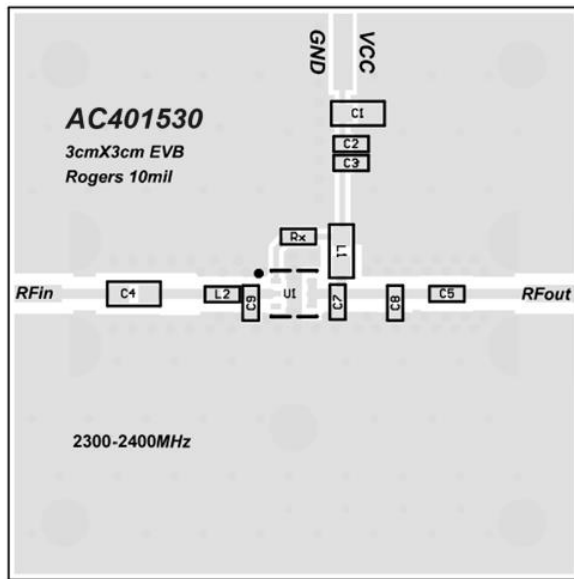
Typical performance on EVB

Typical Performance at +25 °C	(MHz)	2110	2140	2170
Small Signal Gain	dB	13.7	13.8	13.9
Input Return Loss	dB	-14.4	-17.9	-24.0
Output Return Loss	dB	-15.9	-17.0	-19.4
P1dB	dBm	30.9	30.9	30.8
OIP3 (+15dBm/tone, $\Delta f=1$ MHz)	dBm	45.2	45	45.2
WCDMA Channel power (at -50dBc ACLR)	dBm	21	20.9	20.5
Efficiency at Pout=30dBm	%	48.3	47.6	47.0
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



2300MHz~2400MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innegration	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	0.7pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C7	1.8pF	CAP, SMD, 0402	various	
C8	2pF	CAP, SMD, 0402	various	
C9	2pF	CAP, SMD, 0402	various	
L1	4.3nH	Coli IND, SMD, 0603	TDK	
L2	0.8nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

Critical component placement locations

Distance from U1 Pin2 Pad (left edge) to C9 (right edge): 30mil

Distance from C9 (left edge) to L2 (right edge): 15mil

Distance from L2 (left edge) to C4 (right edge): 103.5mil

Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil

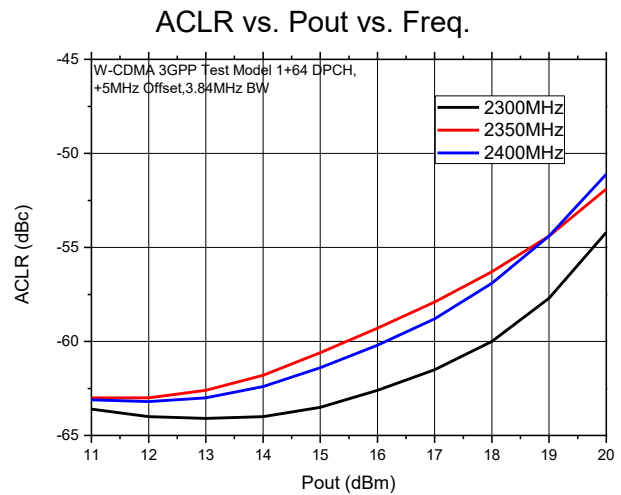
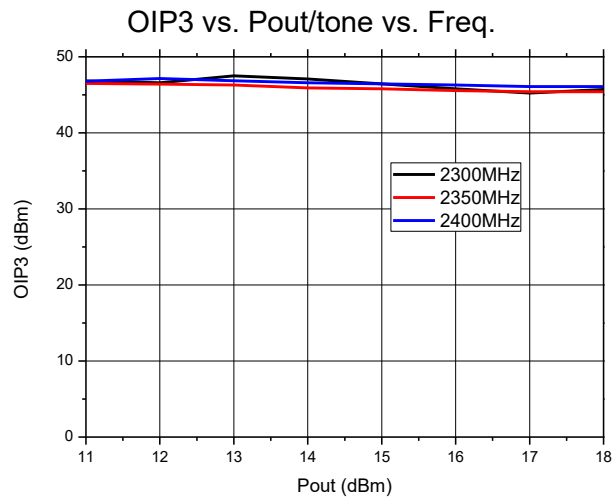
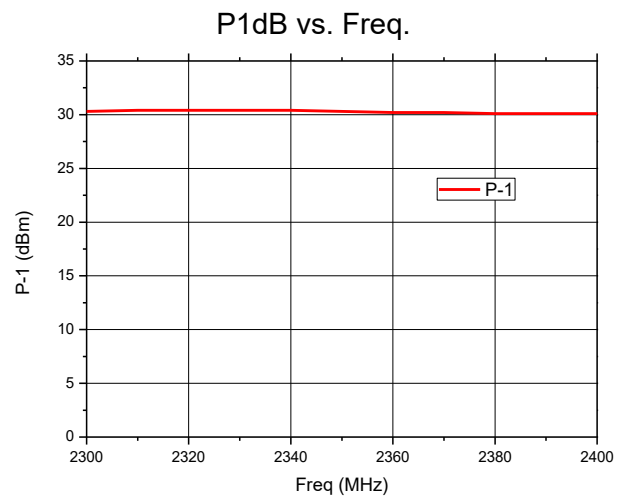
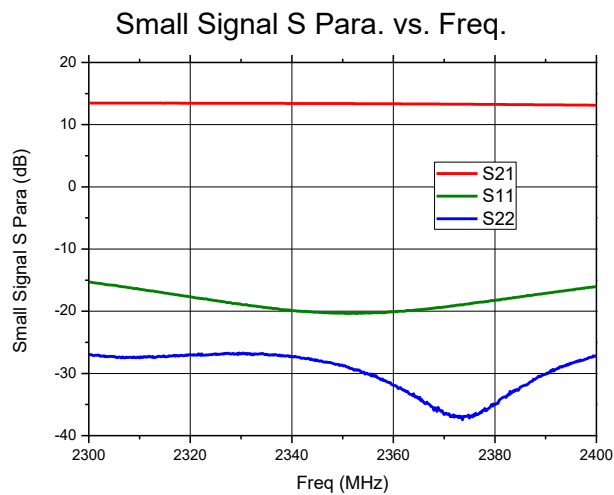
Distance from C7 (right edge) to C8 (left edge): 93.5mil

Distance from C8 (right edge) to C5 (left edge): 64mil

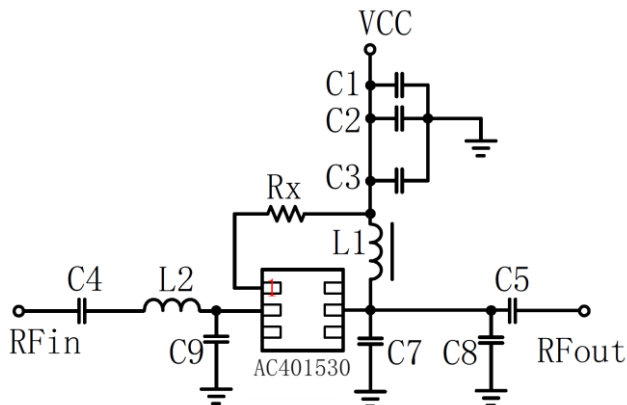
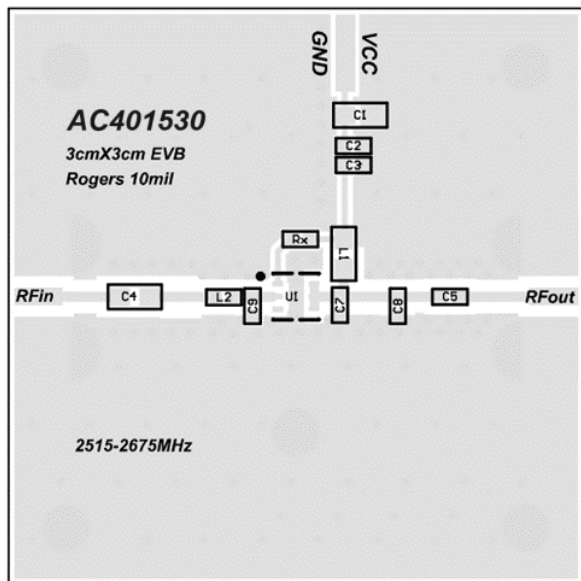
Typical performance on EVB

Typical Performance at +25 °C	(MHz)	2300	2350	2400
Small Signal Gain	dB	13.5	13.4	13.1
Input Return Loss	dB	-15.3	-20.31	-16
Output Return Loss	dB	-27.1	-28.8	-27.2
P1dB	dBm	30.3	30.3	30.1
OIP3 (+15dBm/tone, $\Delta f=1\text{MHz}$)	dBm	46.4	45.8	46.4
WCDMA Channel power (at -50dBc ACLR)	dBm	20.8	20.7	20.3
Efficiency at Pout=30dBm	%	43.6	45.1	46.0
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



2515MHz~2675MHz Application



Bill of material

Reference Des.	Value	Description	Manuf.	Part Number
PCB		Printed circuit Board,3CMX3CM		
U1		AC401530, DFN2x2_6L	Innogrations	AC401530
C1	22uF	CAP, SMD, 0603	various	
C2	1000pF	CAP, SMD, 0402	various	
C3	10pF	CAP, SMD, 0402	various	
C4	0.5pF	CAP, SMD, 0603	Dalicap	
C5	22pF	CAP, SMD, 0402	various	
C7	1.8pF	CAP, SMD, 0402	various	
C8	1.8pF	CAP, SMD, 0402	various	
C9	1.3pF	CAP, SMD, 0402	various	
L1	4.3nH	Coli IND, SMD, 0603	TDK	
L2	0.8nH	IND, SMD, 0402	various	
Rx	200 Ω	RES, SMD, 0402	various	

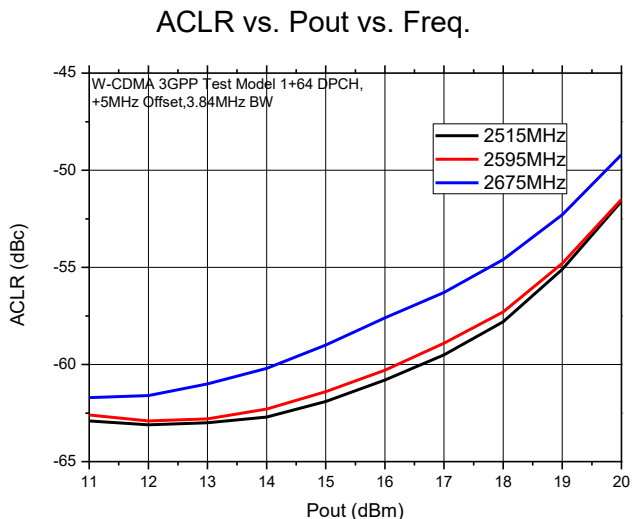
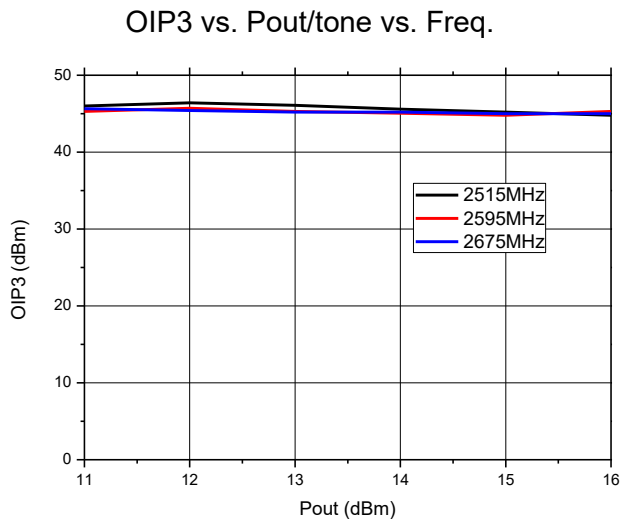
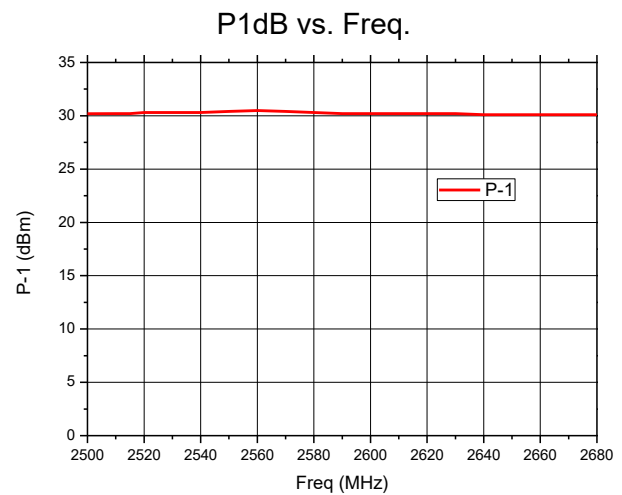
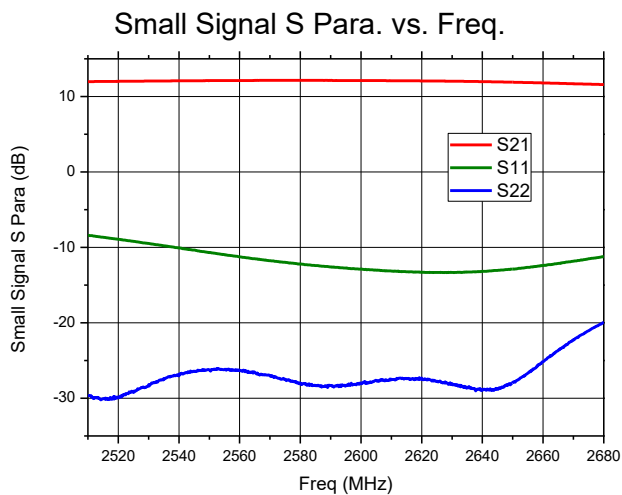
Critical component placement locations

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 Distance from U1 Pin5 Pad (right edge) to C7 (left edge): 30mil
 Distance from C7 (right edge) to C8 (left edge): 93.5mil
 Distance from C8 (right edge) to C5 (left edge): 64mil

Typical performance on EVB

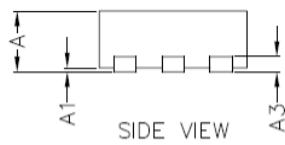
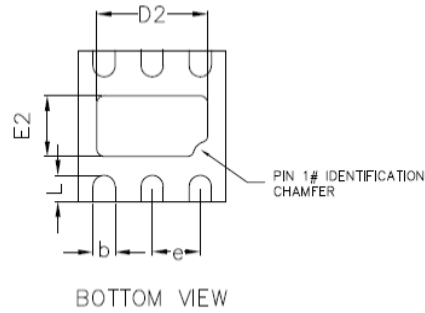
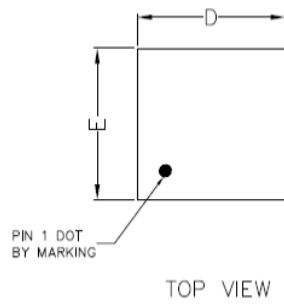
Typical Performance at +25 °C	(MHz)	2515	2595	2675
Small Signal Gain	dB	12.0	12.1	11.6
Input Return Loss	dB	-8.7	-12.7	-11.5
Output Return Loss	dB	-30.1	-28.3	-21.1
P1dB	dBm	30.2	30.2	30.1
OIP3 (+15dBm/tone, $\Delta f=1\text{MHz}$)	dBm	45.2	44.8	45
WCDMA Channel power (at -50dBc ACLR)	dBm	20.4	20.3	20.1
Efficiency at Pout=30dBm	%	45.0	45.7	45.3
Supply Voltage, Vcc	V	5		
Quiescent Collector Current (at Rx=200 Ω), Icq	mA	160		

Performance plots



Package Diagram

(Units: millimeters)



COMMON DIMENSIONS(MM)			
PKG.	W:VERY VERY THIN		
REF.	MIN.	NOM.	MAX
A	0.70	0.75	0.80
A1	0.00	—	0.05
A3	0.2 REF.		
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	1.35	1.50	1.60
E2	0.65	0.80	0.90
L	0.25	0.35	0.45
b	0.25	0.30	0.35
e	0.65 BSC		