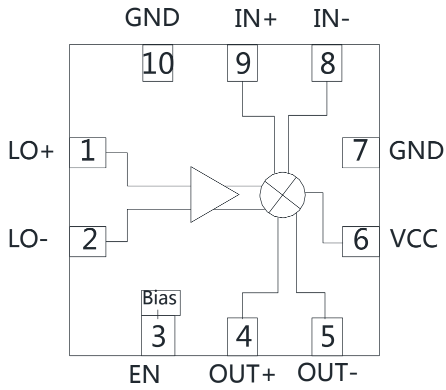
Performance Features

- Broadband frequency range up to 7 GHz
- Up-conversion / down-conversion
- Variable frequency gain: 5.1dB@Fout=0.9GHz
- Power consumption: 132mW
- Package size: QFN 2*2 10L

Typical Applications

- Testing Instruments
- Wireless Infrastructure
- VHF and UHF Mixers

Functional Block Diagram



Overview

The CWM195SP2C is a 01MHz~7GHz broadband low power active dual balanced mixer with small size, low power consumption, low noise, flexible application, and fully differential port.

DC Electrical Properties Table

Parameters	Description	Minimum value	Typical values	Maximum value	Unit
Operating Voltage	VCC	3	3.3	3.6	V
Operating current	ICC		40		mA

AC Electrical Properties Table

Parameters	Description	Minimum value	Typical values	Maximum value	Unit
Input Frequency Range	External Matching	0.01		7	GHz
Output Frequency Range	External Matching	DC		7	GHz
LO frequency range	External Matching	LF		9	GHz

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Upconversion electrical performance table（T A = 2 5 ℃，Pin=-12 dBm, PL0=0dBm,VCC=EN=3. 3V ）

Parameter indicators	Description	Minimum value	Typical values	Maximum value	Unit
Variable frequency gain	Fin=140MHz Fout=900MHz, HIGH LO		5. 1		dB
	Fin=240MHz Fout=3. 6GHz, LOW LO		1. 2		dB
	Fin=900MHz Fout=5. 8GHz LOW LO		-0. 8		dB
Return loss	Fin=140M		26	--	dB
	FLO=1040M		18	--	dB
	Fout=900M		13	--	dB
	Fin=240M		25		dB
	FLO = 3. 36G		18		dB
	Fout=3. 6G		19		dB
	Fin=900M		19		dB
	FLO = 4. 9G		20		dB
	Fout=5. 8G		18. 6		dB
Isolation degree: IN-LO	Fin=140MHz, FLO=1040MHz, Fout=900MHz		58		dB
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		52		dB
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		42. 5		dB
Isolation degree: IN-OUT	Fin=140MHz, FLO=1040MHz, Fout=900MHz		63		dB
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		67		dB
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		58		dB
Isolation degree: LO-IN	Fin=140MHz, FLO=1040MHz, Fout=900MHz		43		dB
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		41. 3		dB
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		37. 5		dB
Isolation degree: LO-OUT	Fin=140MHz, FLO=1040MHz, Fout=900MHz		26		dB
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		30		dB
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		20		dB
Input P1dB	Fin=140MHz, Fout=900MHz		4. 7		dBm
	Fin=240MHz, Fout=3. 6GHz		3. 8		dBm
	Fin=900MHz, Fout=5. 8GHz		3. 9		dBm
Input third-order intermodulation Point IIP3	Fin=140MHz, FLO=1040MHz, Fout=900MHz		17. 7		dBm
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		14		dBm
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		11. 6		dBm
Output third-order intermodulation Point OIP3	Fin=140MHz, FLO=1040MHz, Fout=900MHz		22. 8		dBm
	Fin=240MHz, FLO=3. 36GHz, Fout=3. 6GHz		15		dBm
	Fin=900MHz, FLO=4. 9GHz, Fout=5. 8GHz		10. 7		dBm
Input second-order intermodulation Point IIP2	Fin=140MHz, Fout=900MHz		38. 6		dBm
	Fin=240MHz, Fout=3. 6GHz		35		dBm
	Fin=900MHz, Fout=5. 8GHz		43		dBm
Noise factor NF	Fin=140MHz, Fout=900MHz		9. 4		dB
	Fin=240MHz, Fout=3. 6GHz		14. 2		dB
	Fin=900MHz, Fout=5. 8GHz		16. 4		dB

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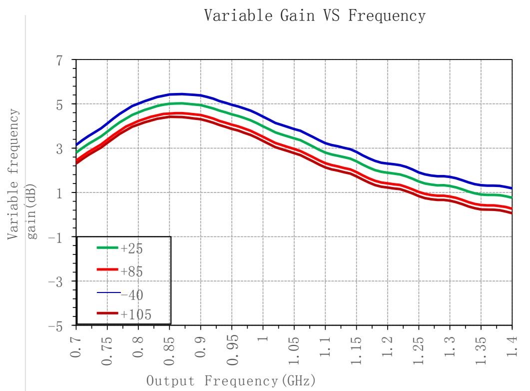
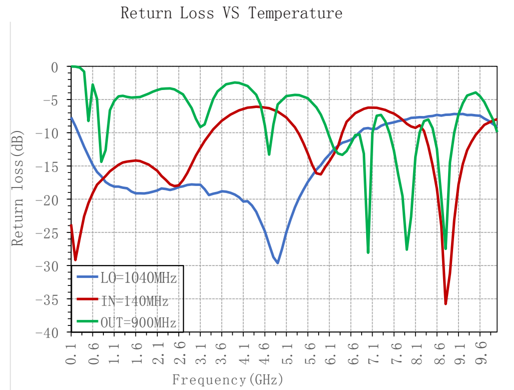
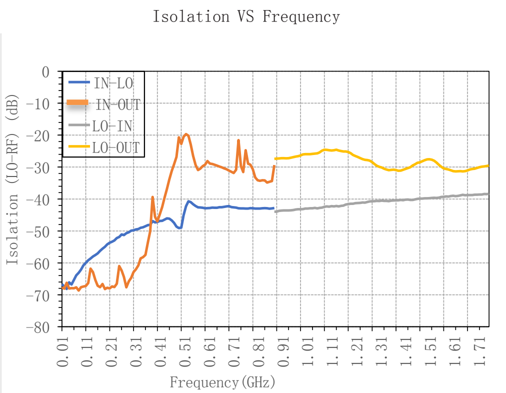
Downconversion electrical performance table (T A = 2 5 ℃ , PIn=-12dBm, P L 0 = 0 d B m , V CC=EN=3. 3V)

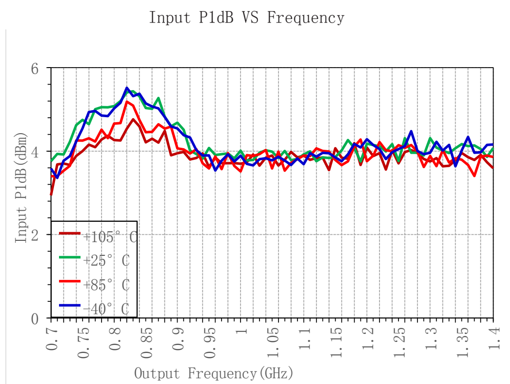
Parameter indicators	Description	Minimum value	Typical values	Maximum value	Unit
Variable frequency gain	Fin=0. 9GHz Fout=0. 14GHz, HIGH LO		4. 7		dB
	Fin=3. 5GHz Fout=0. 456GHz, HIGH LO		3. 3		dB
	Fin=5. 8GHz Fout=0. 8GHz, LOW LO		1. 7		dB
Return loss	Input Fin=0. 9G		16		dB
	FLO=1. 04G at the local oscillator		21		dB
	Output Fout=0. 14G		14		dB
	Input Fin=3. 5G		24		dB
	FLO=3. 956G at the local oscillator		20		dB
	Output Fout=0. 456G		13		dB
	Input Fin=5. 8G		20		dB
	FLO=5. 0G at the local oscillator		35		dB
	Output Fout=0. 8G		18		dB
Isolation degree: IN-LO	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		60		dB
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		43. 7		dB
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		37		dB
Isolation degree: IN-OUT	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		56		dB
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		44		dB
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		44. 5		dB
Isolation degree: LO-IN	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		44		dB
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		42		dB
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		37. 5		dB
Isolation degree: LO-OUT	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		56		dB
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		44		dB
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		35. 3		dB
Input P1dB	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		5. 7		dBm
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		1. 7		dBm
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		3. 7		dBm
Input third-order intermodulation Point IIP3	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		17		dBm
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		11. 2		dBm
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		11. 4		dBm
Output third-order intermodulation Point OIP3	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		21. 5		dBm
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		14. 4		dBm
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		13. 3		dBm
Input second-order intermodulation Point IIP2	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		56		dBm
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		31. 5		dBm
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		46. 8		dBm
Noise factor NF	Fin=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz		10		dB
	Fin=3. 5GHz, FLO=3. 956GHz, Fout=0. 456GHz		13. 6		dB
	Fin=5. 8GHz, FLO=5. 0GHz, Fout=0. 8GHz		15. 2		dB

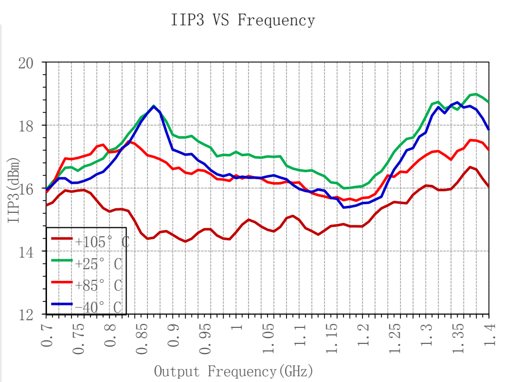
Upconversion test curve (Fin=0.14GHz,FLO=1.04GHz, Fout=0.9GHz, VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

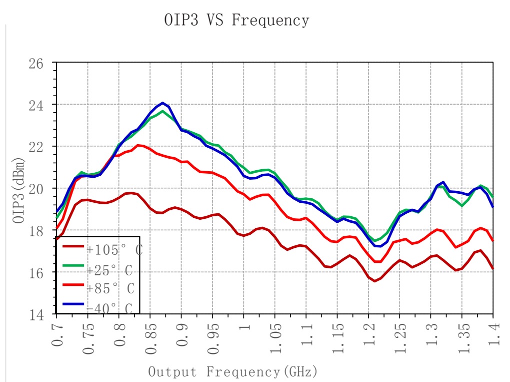












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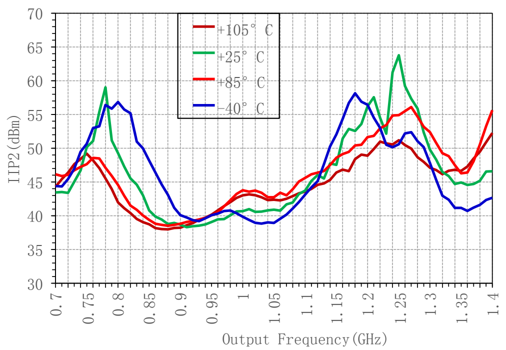
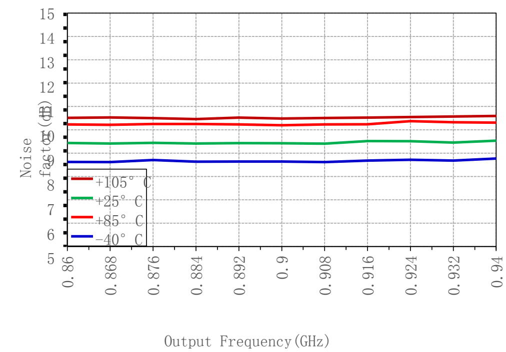
Upconversion test curve (A0:Fin=0.14GHz,FLO=1.04GHz,Fout=0.9GHz,VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

IIP2 VS Frequency

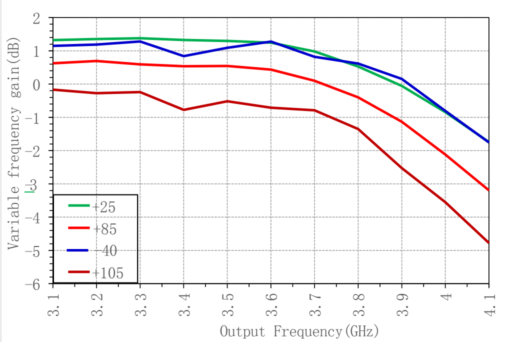


Noise factor VS frequency

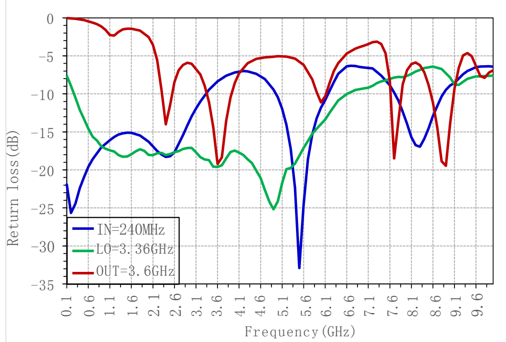


Upconversion test curve (A1:FIn=0.24GHz,FLO=3.36GHz,Fout=3.6GHz,VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

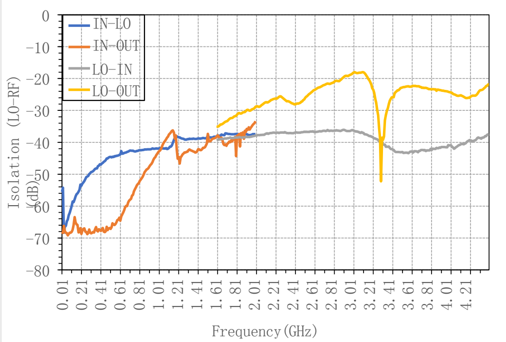
Variable gain VS frequency



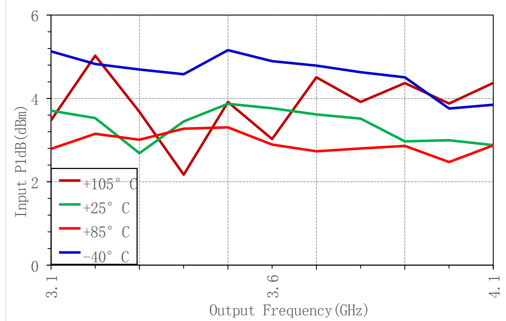
Return loss VS frequency)



Isolation VS Frequency



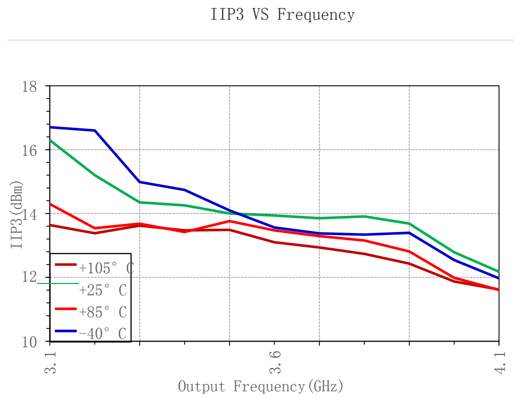
Input P1dB VS Frequency

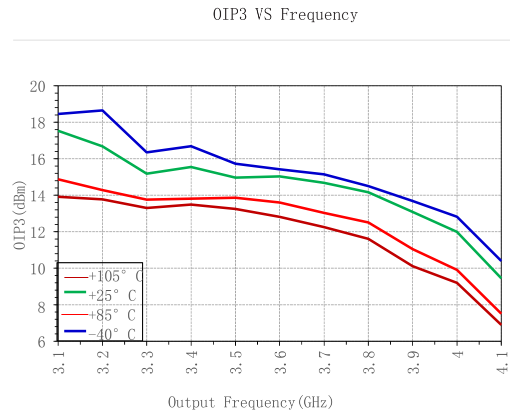


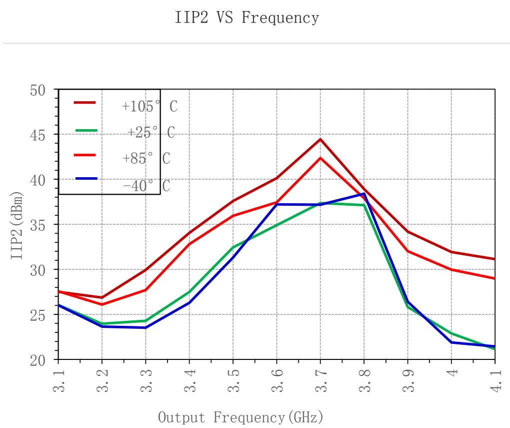
CWM

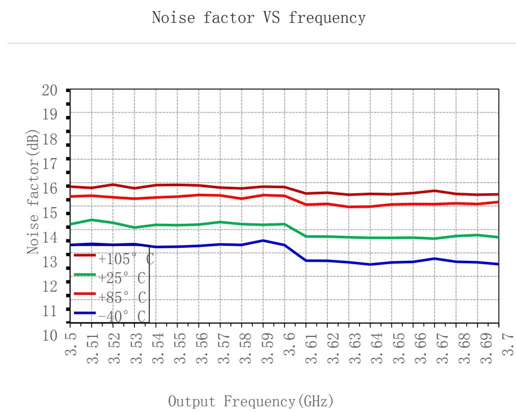
Active Mixer Series

Upconversion test curve (A1:Fin=0.24GHz,FLO=3.36GHz,Fout=3.6GHz,VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

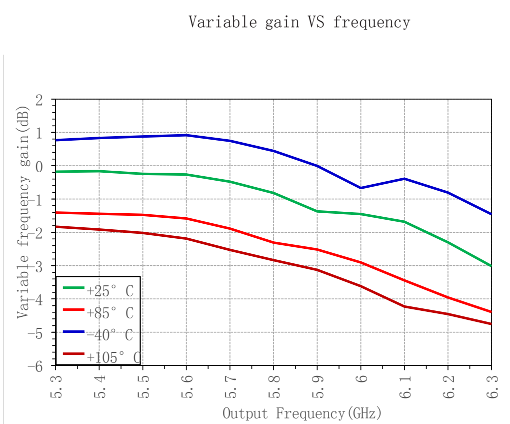


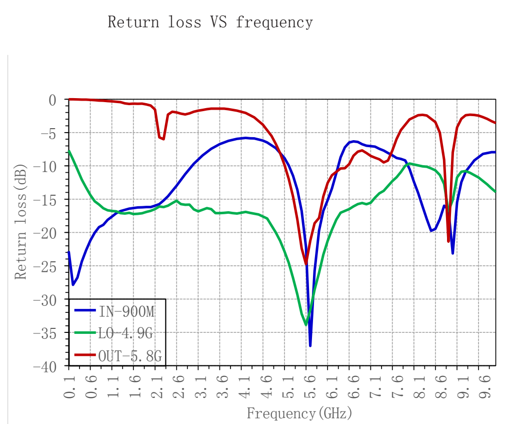






Upconversion test curve (A2:FIn=0.9GHz,FLO=4.9GHz,Fout=5.8GHz,VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)





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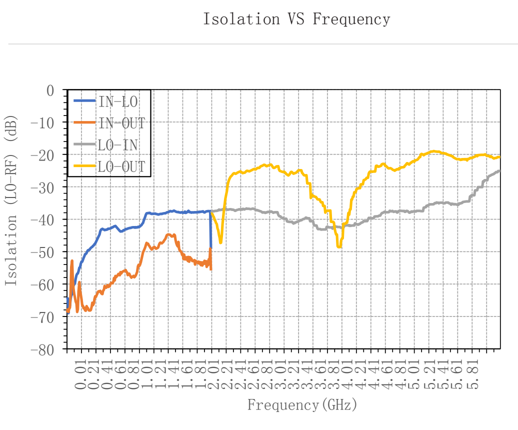
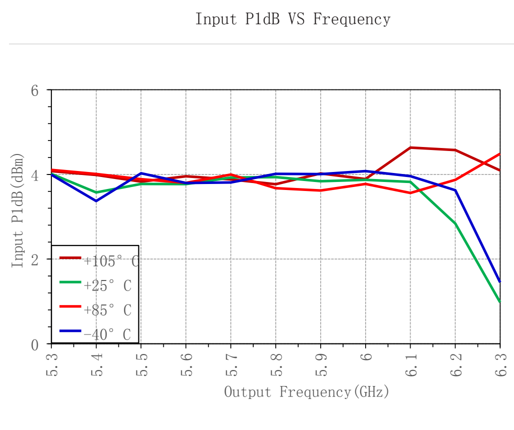
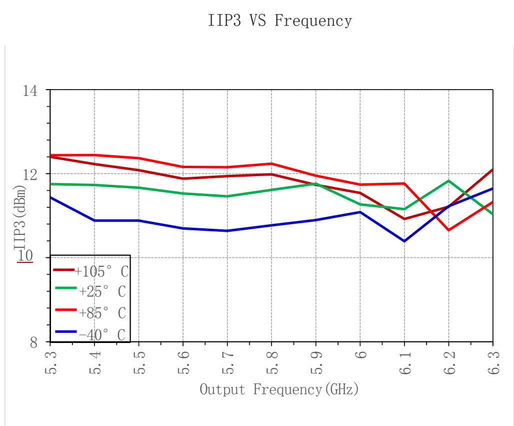
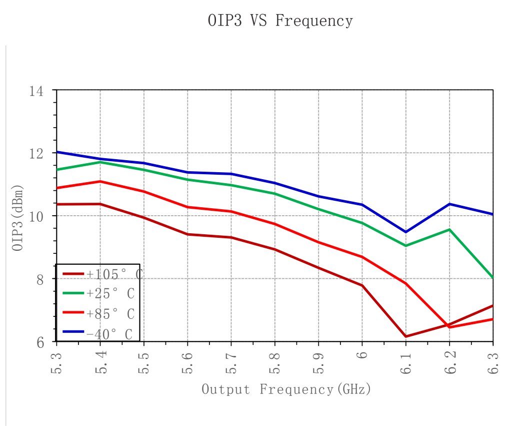
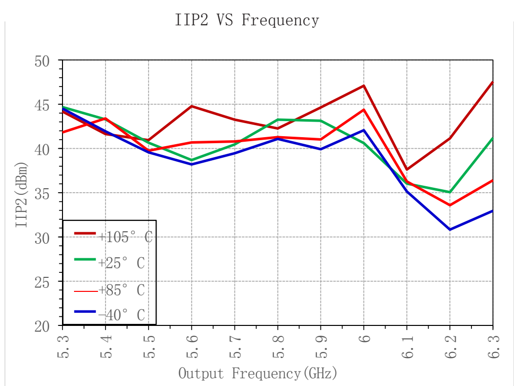
Upconversion test curve (A2:Fin=0.9GHz,FLO=4.9GHz ,Fout=5.8GHz,VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

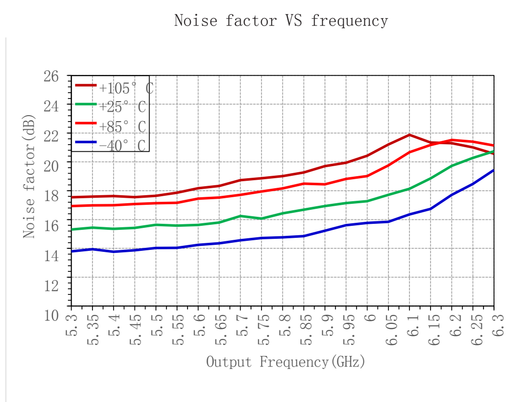












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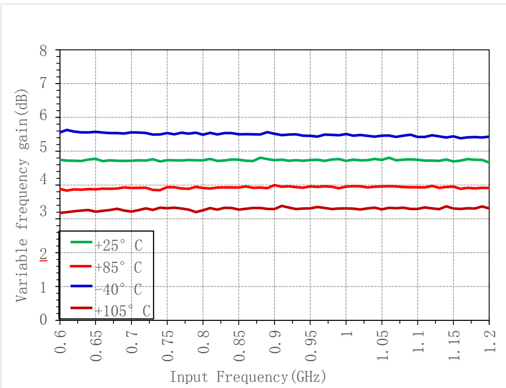
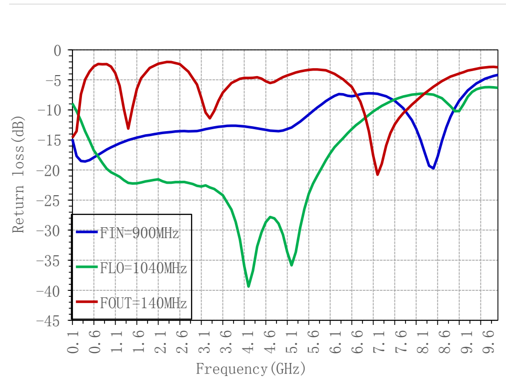
Down-conversion test curve (B0: FIn=0. 9GHz, FLO=1. 04GHz, Fout=0. 14GHz, VCC=EN=3 3V, PIn=-12dBm, PLO=0dBm)

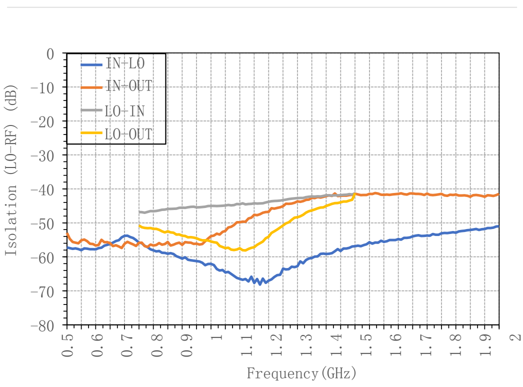
Variable Gain VS Frequency



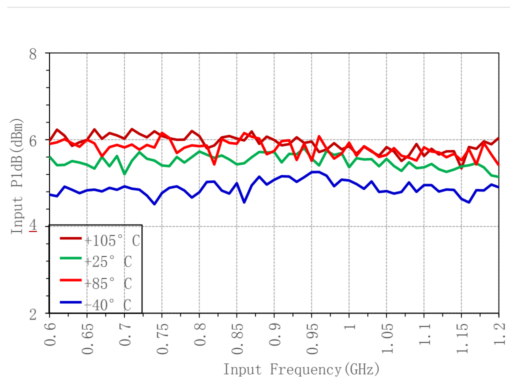
Return Loss VS Frequency



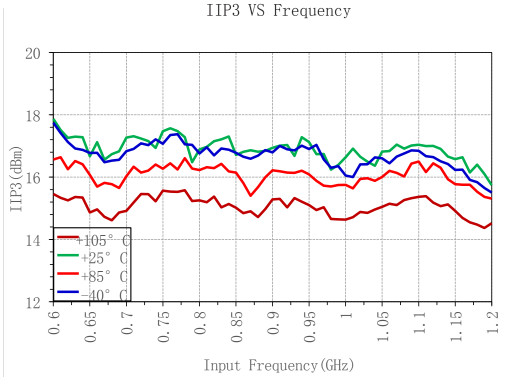
Isolation VS Frequency



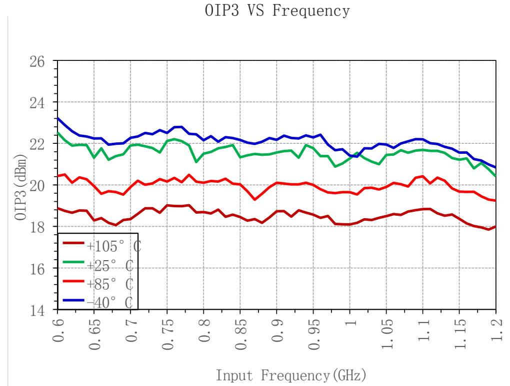
Input P1dB VS Frequency



IIP3 VS Frequency



OIP3 VS Frequency



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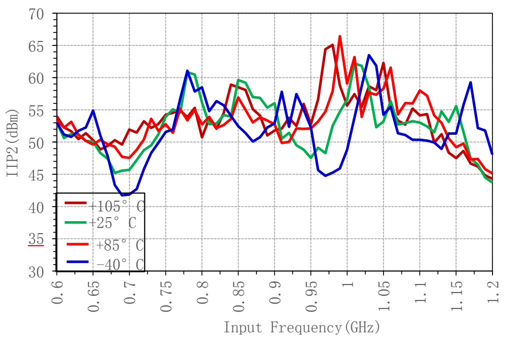
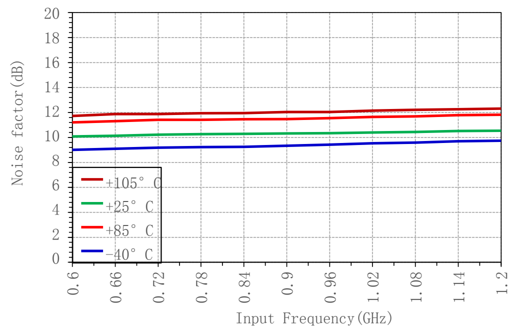
Down conversion test curve (B0:Fin=0.9GHz,FL0=1.04GHz,Fout=0.14GHz, VCC=EN=3.3V,Pin=-12dBm,PL0=0dBm)

IIP2 VS Frequency

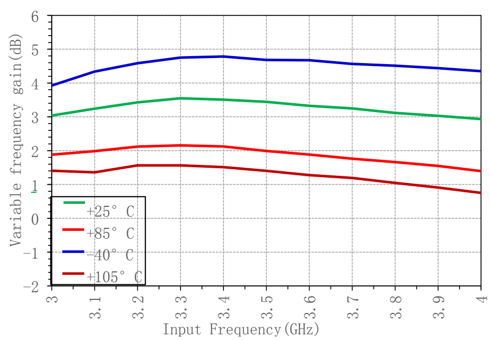


Noise factor VS frequency

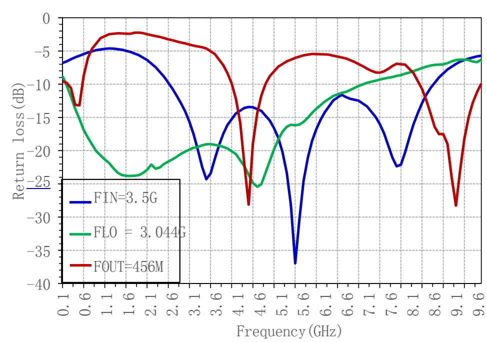


Down conversion test curve (B1:Fin=3.5GHz,FLO=3.956GHz,Fout=0.456GHz, VCC=EN=3.3V,Pin=-12dBm,PLO=0dBm)

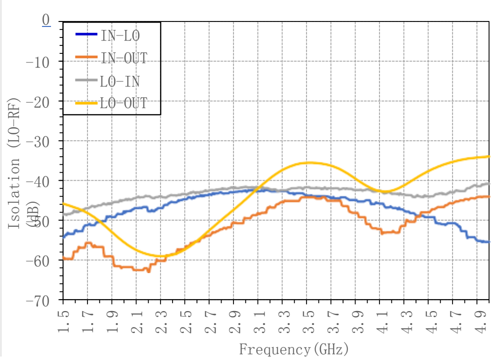
Variable gain VS frequency



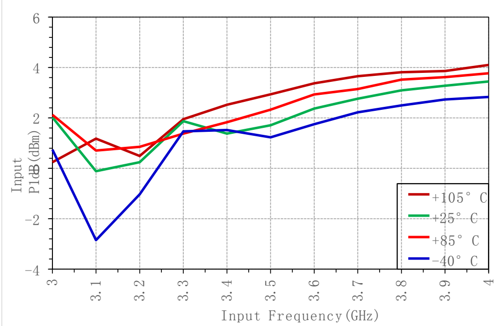
Return loss VS frequency



Isolation VS Frequency



Input P1dB VS Frequency



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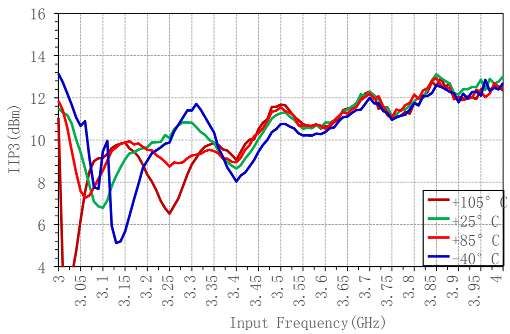
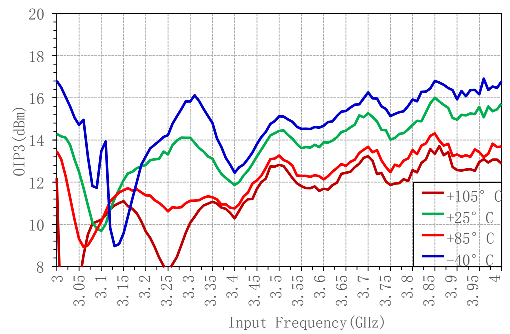
Down-conversion test curve (B1: Fin=3.5GHz, FLO=3.956GHz, Fout=0.456GHz, VCC=EN=3.3V, Pin=-12dBm, PLO=0dBm)

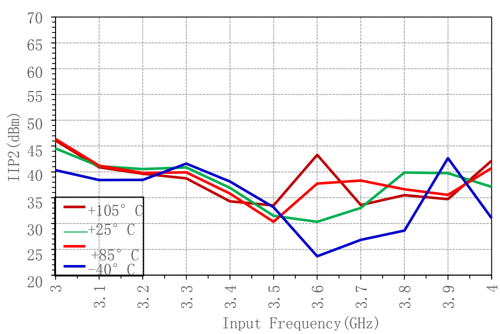
IIP3 VS Frequency



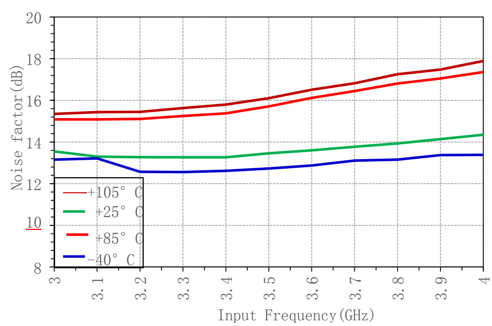
OIP3 VS Frequency



IIP2 VS Frequency

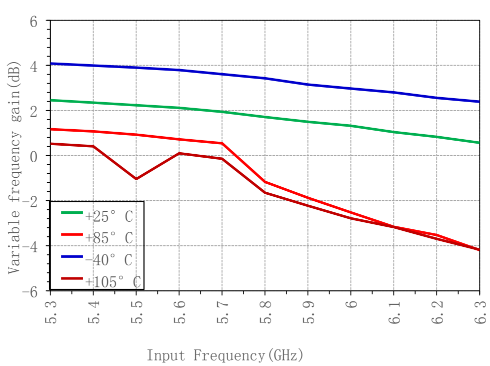


Noise factor VS frequency

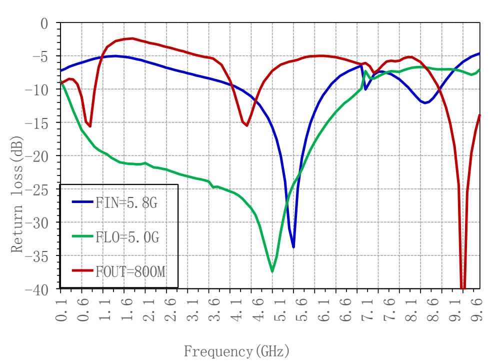


Down-conversion test curve (B2: FIn=5.8GHz, FL0=5.0GHz, Fout=0.8GHz, VCC=EN=3.3V, Pin=-12dBm, PL0=0dBm）

Variable gain VS frequency



Return loss VS frequency



CWM Active Mixer Series

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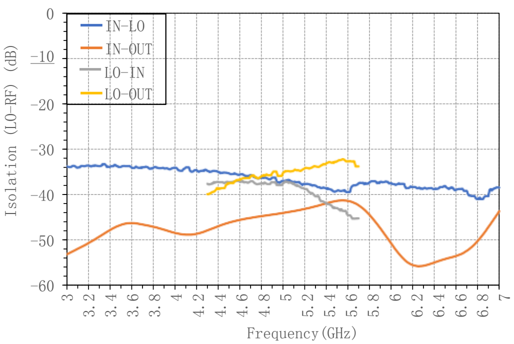
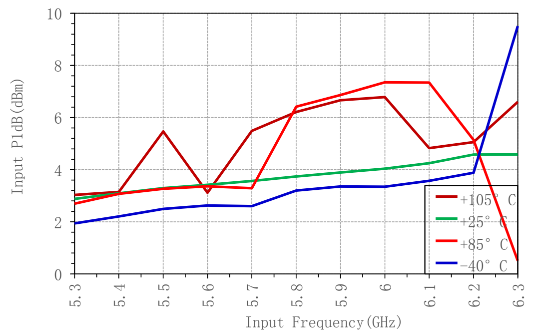
Down-conversion test curve (B2: Fin=5.8GHz, FLO=5.0GHz, Fout=0.8GHz, VCC=EN=3.3V, Pin=-12dBm, PLO=0dBm)

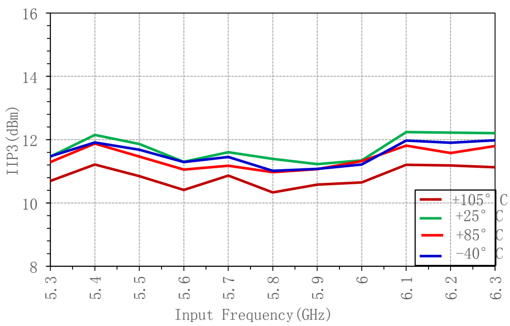
Isolation VS Frequency



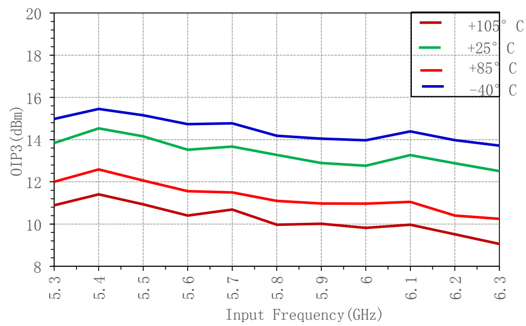
Input P1dB VS Frequency



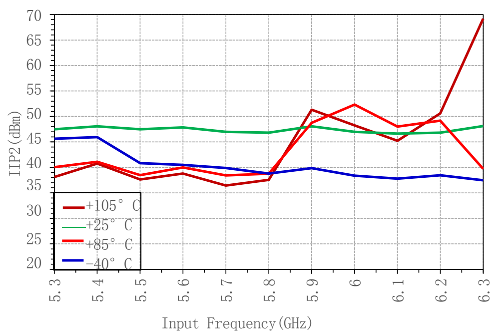
IIP3 VS Frequency



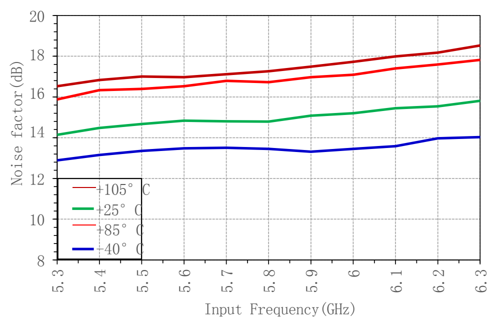
OIP3 VS Frequency



IIP2 VS Frequency



Noise factor VS frequency



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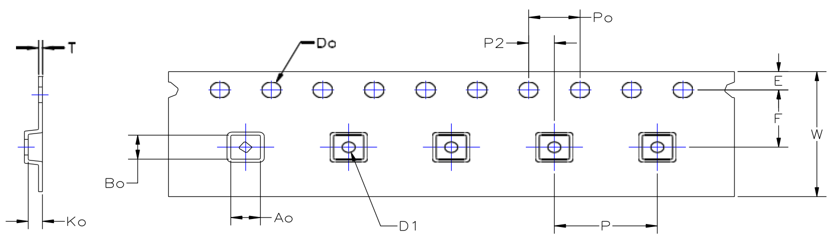
Absolute maximum rating

Operating voltage (VCC, OUT+, OUT−)	4V
EN Voltage	−0.3V to VCC+0.3V
LO+, LO− Input power	+10dBm
IN+, IN− Input power	+15dBm
Operating temperature	−40° C to 105° C
Storage temperature	−65° C to 150° C
ESD	TBD

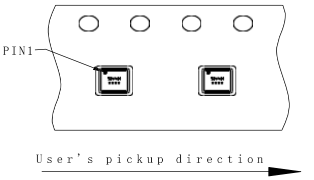
Packaging Information



DIMENSION	SPEC
W	12.00 +/− 0.30
Do	Ø1.50 +0.10/−0.00
Po	4.00 +/− 0.10
E	1.75 +/− 0.10
D1	Ø1.00 MIN
Ao	2.30 +/− 0.10
Bo	2.30 +/− 0.10
P	8.00 +/− 0.10
P2	2.00 +/− 0.10
Ko	1.10 +/− 0.10
T	0.30 +/− 0.05
F	5.50 +/− 0.05

Component orientation in the carrier tape

(Facing carrier tape and reel)



Description:

1. Unit: mm
2. Material: anti-static polyethylene
3. Color: Black
4. 10 positioning holes center distance (P0) cumulative tolerance ± 0.2

Cautions

1. Attempts to clean the chip surface with wet chemical methods are prohibited.
2. This product is an electrostatic sensitive device, so pay attention to anti-static when storing and using it.
3. Store in dry, nitrogen atmosphere.

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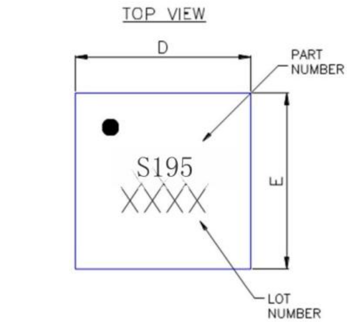
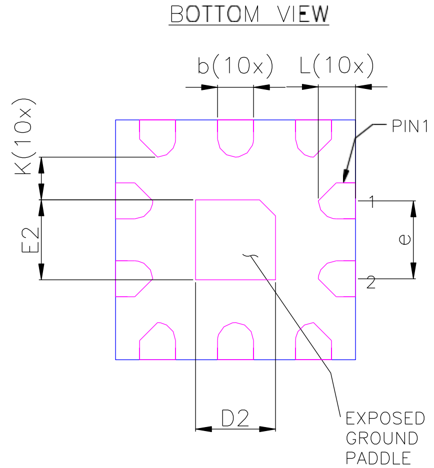
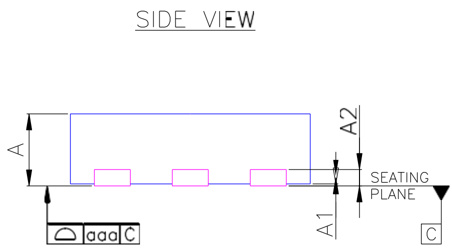
Package Outline Diagram







Description: 1. Unit: mm

2. Lead frame material: copper alloy
3. Package surface warpage: ≤0.05mm
4. All ground pins should be connected to PCB RF ground

SP2C Dimension Table (unit:mm)

Symbol	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2		0.20Ref	
b	0.20	0.25	0.30
D	1.90	2.00	2.10
D2	0.45	0.50	0.55
e		0.50BSC	
E	1.90	2.00	2.10
E2	0.45	0.50	0.55
K	0.20	---	---
L	0.25	0.30	0.35
aaa		0.08	

Pin Definition

Pin Number	Function Symbols	Function Description
7:10	GND	RF ground, Exposed Padlle at the bottom of the package is also an RF ground
1:2	LO+;LO-	The differential LO input, with an input impedance of approximately 100 ohms differential, enables wideband matching, and narrowband matching can also be achieved by external matching. When using the single-ended input, the other end is well grounded through a capacitor. And the internal The circuit provides a DC bias and therefore requires external isolation
3	EN	A voltage greater than 1V applied to this pin will start the chip and less than 0.5V will disable the chip. The turn-on voltage should not exceed 0.3V of VCC voltage
4;5	OUT+;OUT-	Differential output. Requires external matching for conversion to single-ended and a low-resistance DC path to VCC to provide output DC to the mixer, with a typical DC current of 18mA per pin
6	VCC	This pin should be bypassed by a 10nF capacitor close to the IC. It is recommended to use a low impedance power supply layer when designing the board. Typical current is 4mA
8;9	IN-;IN+	The differential input gives the best performance when driven differentially. For single-ended use, the other end needs to be grounded through a capacitor and the internal circuitry provides a DC bias, so external isolation is required.

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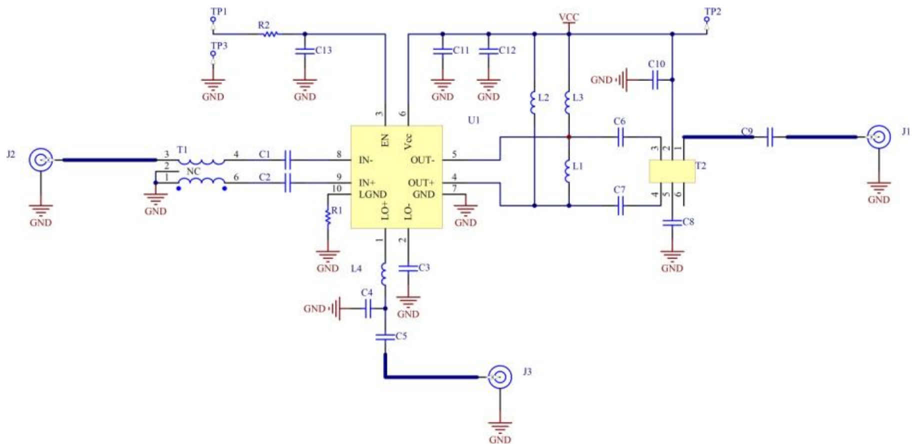
Evaluation board schematic (upconversion)



Designator	Value	Size	Manufacturer Part Number
c1, c2, c3, c8, c9, c10	1nF	0402	Murata GRM Series
C5, C11, C13	100pF	0402	Murata GRM Series
C12	4.7uF	0402	Murata GRM Series
C4	NC	0402	
R1	0Ω	0402	
R2	100Ω	0402	
T1	Balun 1:1 (4.5MHz-3000MHz)	AT22 4-1	Mini-Circuits TC1-1-13M+
J1, J2, J3	SMA-K PCB Connectors		Aowen D550B12E01-023
TP1, TP2, TP3	DC test terminal		Keystone 5005
U1	CWM195SP2C		SiCore Semi CWM195SP2C
EVAL-CWM195SP2C-A0, f_{IN}= 140MHz, f_{LO}= 1040MHz, f_{OUT} = 900MHz			
C6, C7.	1.8pF	0402	Murata GJM Series
L1	NC	0402	
L2, L3	15nH	0402	Murata GJM Series
L4	1.3nH	0402	Murata LQW Series
T2	Balun 4:1 (800MHz-2.6GHz)	0805	Mini-Circuits BD0826J50200AHF
EVAL-CWM195SP2C-A1, f_{IN}= 240MHz, f_{LO}= 3.36GHz, f_{OUT} = 3.6GHz			
C6, C7.	1pF	0402	Murata GJM Series
L1	5.8nH	0402	Murata LQW Series
L2, L3	4.7nH	0402	Murata GJM Series
L4	1.3nH	0402	Murata LQW Series
T2	Balun 4:1 (3.3GHz-4.2GHz)	0805	Mini-Circuits NCS4-442+
EVAL-CWM195SP2C-A2, f_{IN}= 900MHz, f_{LO}= 4.9GHz, f_{OUT} = 5.8GHz			
C6, C7.	1pF	0402	Murata GJM Series
L1	1.5nH	0402	Murata LQW Series
L2, L3	6.2nH	0402	Murata GJM Series
L4	0Ω	0402	
T2	Balun 4:1 (4.5GHz-6GHz)	0805	Mini-Circuits NCS4-63+

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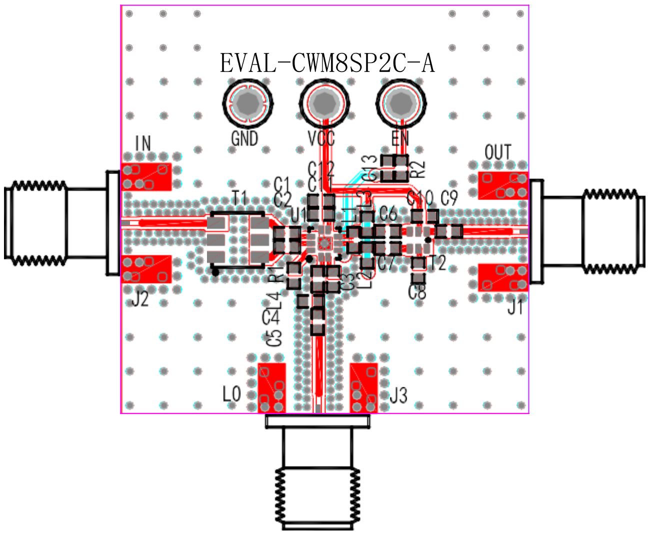
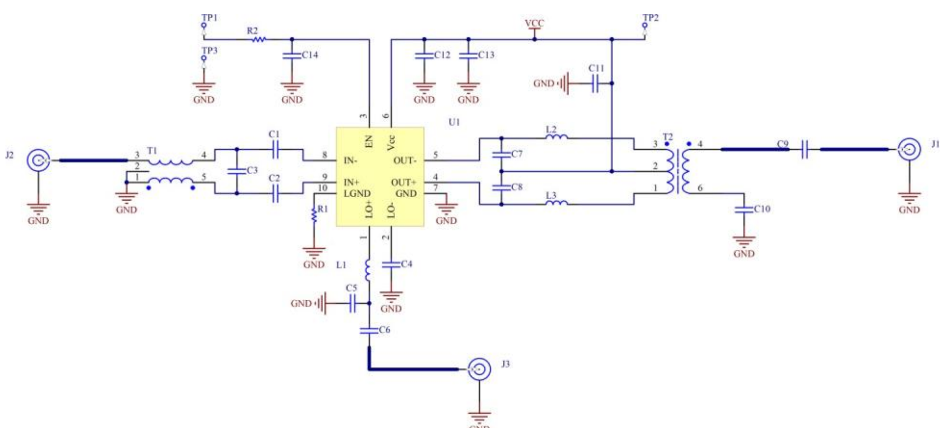
Evaluation board circuit diagram (upconversion)



Evaluation board schematic (down conversion)



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Evaluation board circuit diagram (down conversion)

Designator	Value	Size	Manufacturer Part Number
C4, C9, C10	1nF	0402	Murata GRM Series
C11, C12, C14	100pF	0402	Murata GRM Series
C13	4.7uF	0402	Murata GRM Series
C6	10nF	0402	Murata GRM Series
C5	3pF	0402	Murata GJM Series
C3	NC	0402	
L1	10nH	0402	Murata LQW Series
R1	0Ω	0402	
R2	100Ω	0402	
T1	Balun 1:1 (10MHz-8000MHz)	DB1627-1	Mini-Circuits TCM1-83X+
J1, J2, J3	SMA-K PCB Connectors		Aowen D550B12E01-023
TP1, TP2, TP3	DC test terminal		Keystone 5005
U1	CWM195SP2C		SiCore Semi CWM195SP2C
EVAL-CWM195SP2C-B0, f_{IN}= 900MHz, f_{LO}= 1040MHz, f_{OUT} = 140MHz			
C1, C2	100pF	0402	Murata GRM Series
C7, C8	1.5pF	0402	Murata GJM Series
L2, L3	180nH	0402	Murata LQW Series
T2	Balun 8:1 (2MHz-500MHz)	AT224-1	Mini-Circuits TC8-1+
EVAL-CWM195SP2C-B1, f_{IN}= 3.5GHz, f_{LO}= 3.044GHz, f_{OUT} = 456MHz			
C1, C2	1.5pF	0402	Murata GJM Series
C7, C8	1pF	0402	Murata GJM Series
L2, L3	56nH	0402	Murata LQW Series
T2	Balun 4:1 (10MHz-1900MHz)	DB714	Mini-Circuits TCM4-19
EVAL-CWM195SP2C-B2, f_{IN}= 5.8GHz, f_{LO}= 4.9GHz, f_{OUT} = 800MHz			
C1, C2	1pF	0402	Murata GJM Series
C7, C8	0.3pF	0402	Murata GJM Series
L2, L3	33nH	0402	Murata LQW Series
T2	Balun 4:1 (10MHz-1900MHz)	DB714	Mini-Circuits TCM4-19

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