

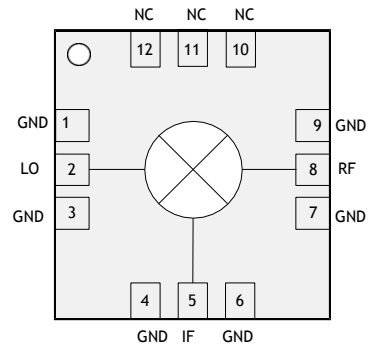
Performance characteristics

- Conversion loss: 8dB
- LO to RF isolation: 35dB
- LO to IF isolation: 32dB
- Passive double balanced topology
- Wide IF bandwidth: DC ~ 16GHz
- Package size: 3mm*3mm 12-lead QFN

Typical application

- Point-to-point communication
- Instruments and meters
- 5G communication

Functional block diagram



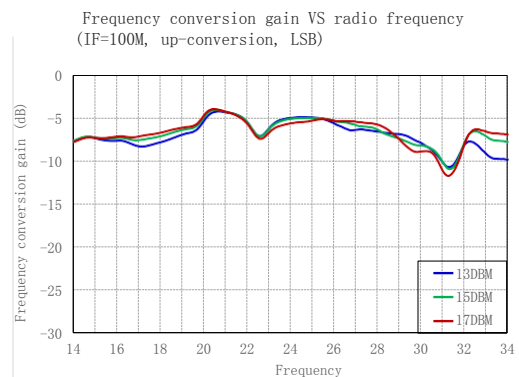
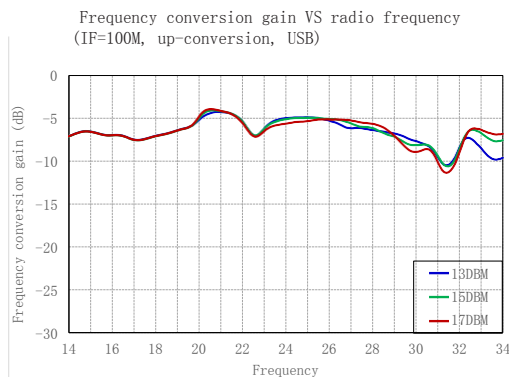
Overview

The CWM139SP3B is a general purpose double balanced mixer manufactured using the GaAs process. The device is passive and does not require bias, external components or matching circuits. It can be used as an up-converter or down-converter with frequencies from 14GHz to 30GHz.

Electrical performance table (TA=+25 °C)

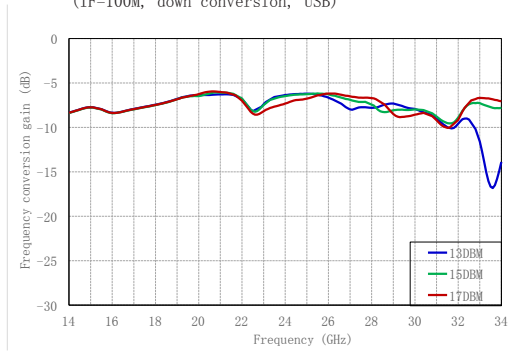
Parameter name	Describe	Minimum value	Typical value	Maximum value	Unit
Radio frequency	RF, LO ports	14 ~ 30			GHz
Intermediate frequency	IF port	DC ~ 16			GHz
Conversion loss			8		dB
Noise figure	SSB		8		dB
Isolation	LO to RF port		35		dB
	LO to IF port		32		dB
	RF to IF ports		25		dB
Enter 1dB compression point			12		dB
Enter IP3			22		dBm

Test curve

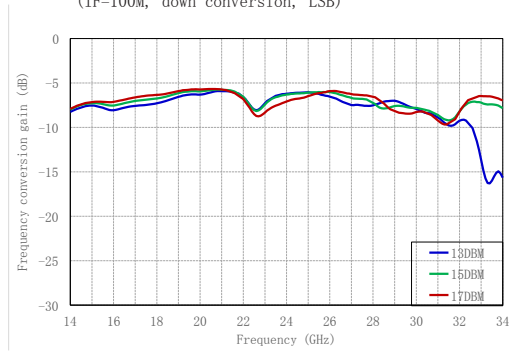


Test curve

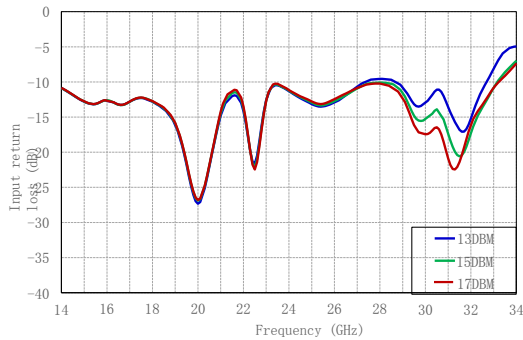
Frequency conversion gain VS radio frequency
(IF=100M, down conversion, USB)



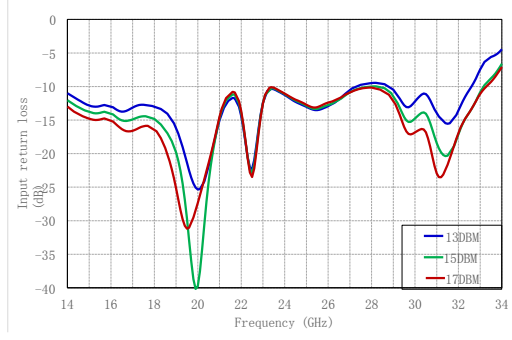
Frequency conversion gain VS radio frequency
(IF=100M, down conversion, LSB)



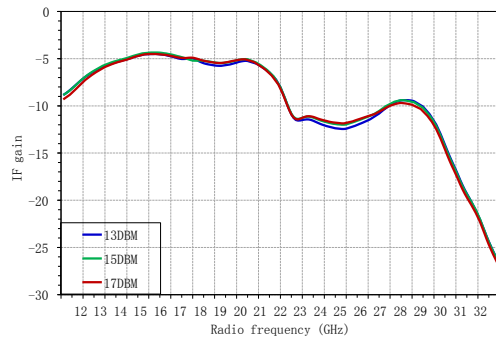
RF Return Loss VS Frequency
(IF=100M, USB)



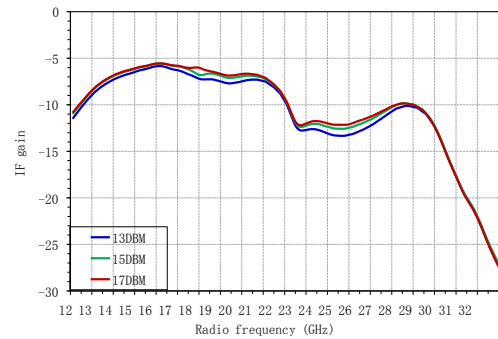
RF Return Loss VS Frequency
(IF=100M, LSB)



Frequency conversion gain VS RF frequency
(LO=12GHz, USB, up-conversion)

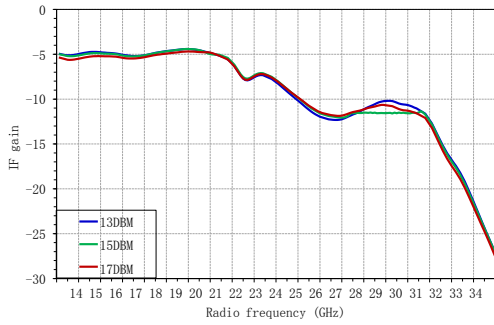


Frequency conversion gain VS radio frequency
(LO=12GHz, USB, down conversion)

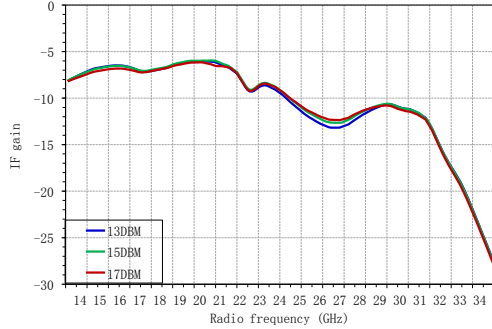


Test curve

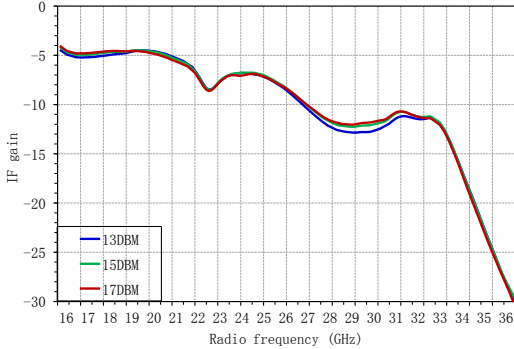
Frequency conversion gain VS RF frequency
(LO=14GHz, USB, up-conversion)



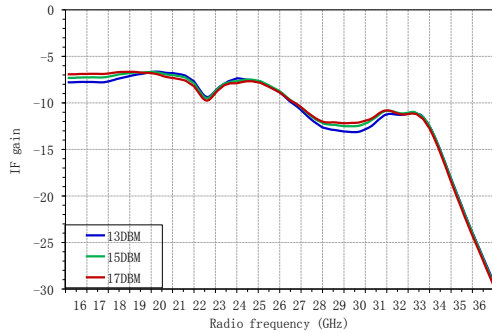
Frequency conversion gain VS RF frequency
(LO=14GHz, USB, down conversion)



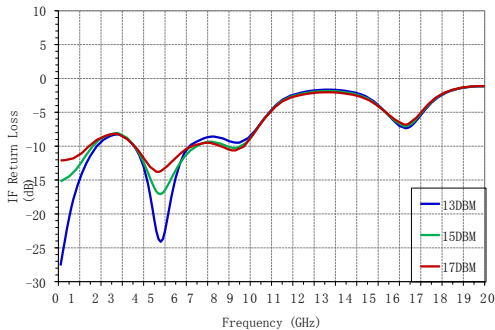
Frequency conversion gain VS RF frequency
(LO=16GHz, USB, up-conversion)



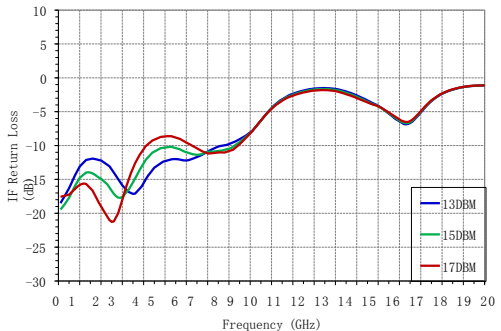
Frequency conversion gain VS RF frequency
(LO=16GHz, USB, down conversion)



IF Return Loss VS Frequency
(LO=12GHz, USB)

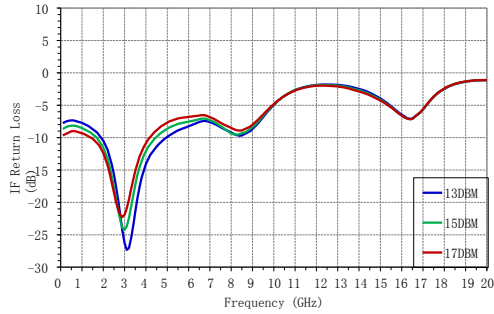


IF Return Loss VS Frequency
(LO=14GHz, USB)

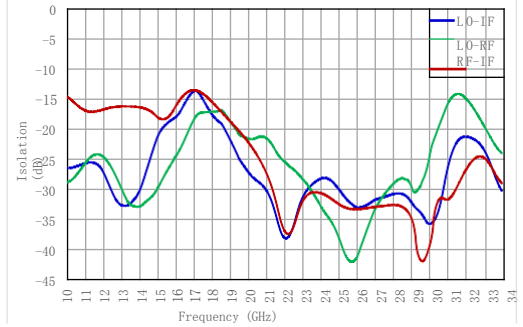


Test curve

IF Return Loss VS Frequency
(LO=16GHz, USB)



Isolation VS frequency



Up-conversion MxN spurious output
(RFout=28GHz)

		M*LO					
		0	1	2	3	4	5
M*IFin	0	/	-16.3	-21	2.6	/	/
	1	0.6	0	27.3	/	/	/
	2	38.37	64.6	/	/	/	/
	3	65.3	62.6	/	/	/	/
	4	72.3	/	/	/	/	/
	5	/	/	/	/	/	/
	IFin = 11GHz & -10dBm; LO = 17GHz & + 15dBm						

Down Conversion MxN Spurious Output
(IF=1GHz)

		M*LO					
		0	1	2	3	4	5
M*RF	0	/	-23.1	14.9	27.7	/	/
	1	17.6	0	18.8	34.3	68.6	/
	2	/	62.2	80.2	41.9	48.5	79.2
	3	/	/	72	79.2	77.7	57.8
	4	/	/	/	/	74	79.6
	5	/	/	/	/	/	/
	RF = 28GHz & -10dBm; LO = 17GHz & + 15dBm						

Up-conversion MxN spurious output
(RFout=28GHz)

		M*LO					
		0	1	2	3	4	5
M*IFin	0	/	-3.7	/	/	/	/
	1	17.4	0	/	/	/	/
	2	56.2	48.3	/	/	/	/
	3	75.9	62.5	/	/	/	/
	4	87.8	79	/	/	/	/
	5	84.3	80.3	/	/	/	/
	IFin = 1GHz & -10dBm; LO=27GHz & + 15dBm						

Down Conversion MxN Spurious Output
(IF=1GHz)

		M*LO					
		0	1	2	3	4	5
M*RF	0	/	-0.8	/	/	/	/
	1	23.2	0	50.2	/	/	/
	2	/	81.8	60.3	70.8	/	/
	3	/	/	81.8	81.8	82.8	78.8
	4	/	/	/	81.8	83.8	86.8
	5	/	/	/	/	85.8	88.8
	RF = 28GHz & -10dBm; LO = 27GHz & + 15dBm						

Operating parameters

Operating temperature	-40 °C ~ + 85 °C
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Absolute maximum rating

RF input power	25dBm
LO input power	25dBm
Storage temperature	-65 °C ~ + 150 °C
ESD (HBM)	TBD

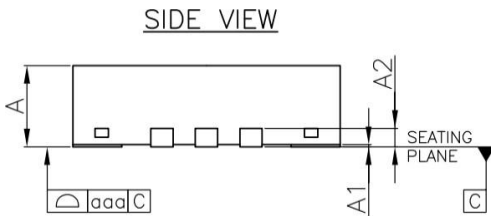
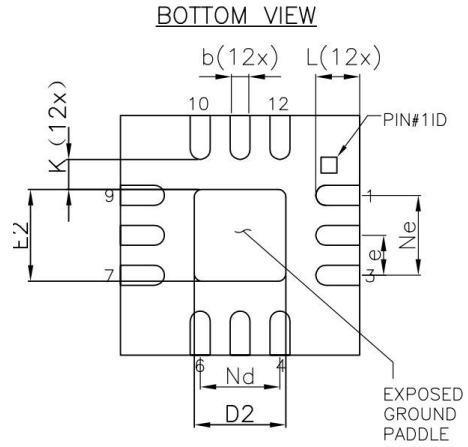
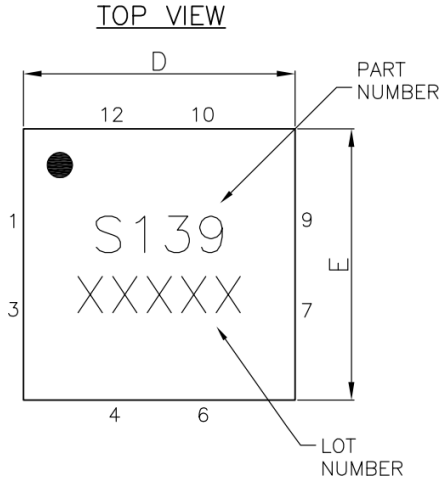
Encapsulation information

Model	Packaging material	Pad coating	MSL Rank [1]	Package ID [2]	Environmental protection requirements
CWM139SP3B	Green resin compound	NiPdAuAg	MSL 3	S139 XXXXX	RoHS compliant

[1] Maximum reflow soldering temperature 260 °C

[2] XXXXX is the batch number

Overall dimensions



Symbol	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.20Ref		
b	0.18	0.25	0.30
D	2.90	3.00	3.10
D2	1.00	1.15	1.25
e	0.50BSC		
Ne	1.00BSC		
Nd	1.00BSC		
E	2.90	3.00	3.10
E2	1.00	1.15	1.25
K	0.20	---	---
L	0.45	0.55	0.65
aaa	0.08		

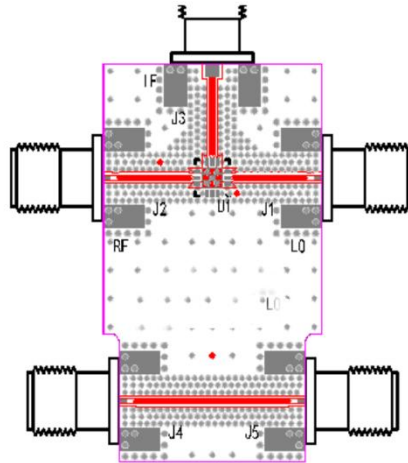
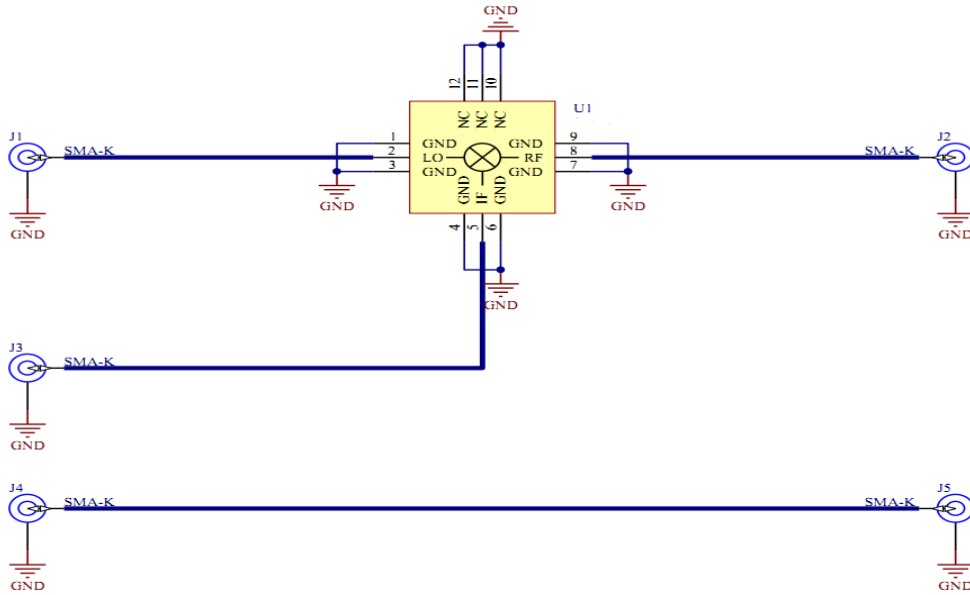
Description:

1. Unit: mm
2. Lead frame material: Copper alloy
3. Package surface warpage: $\leq 0.05\text{mm}$
4. Please connect all ground pins to PCB RF ground

Pin definition

Pin number	Functional symbol	Functional description	Pin number	Functional symbol	Functional description
1	GND	Radio frequency ground	7	GND	Radio frequency ground
2	LO	Local oscillator input	8	RF	Radio frequency input
3	GND	Radio frequency ground	9	GND	Radio frequency ground
4	GND	Radio frequency ground	10	NC	Vacancy
5	IF	IF output	11	NC	Vacancy
6	GND	Radio frequency ground	12	NC	Vacancy

Evaluation board



Circuit board material: Rogers 4350B

The circuit board used in the device shall be designed according to the design method of RF circuit, the signal line shall be designed according to the impedance of 50 ohm, and the grounding pin of the package housing shall be grounded nearby (similar to the figure), and there shall be enough grounding holes connecting the top layer and the bottom layer.

DeCwgnator	Description
J1, J2, J3, J4, J5	SMA-K connector
U1	CWM139SP3B
Nanjing Aowen D550B12E01-023 SMA is recommended for J1, J2 and J3, J4, J5 Joint	