

High IIP3 GaAs MMIC Mixer with Integrated LO amplifier 1700~2700MHz

General Description

The WTM402 is a high linearity and dynamic range passive mixer with an integrated LO driver amplifier in an ultra-small lead-free/green/RoHS-compliant MSOP-8 package. The Mixer MMIC is able to operate across from 1700MHz to 2700MHz frequency range to achieve +29.7dBm Input IP3 while drawing a very low 35mA on 5V and 23mA on 3.3V.

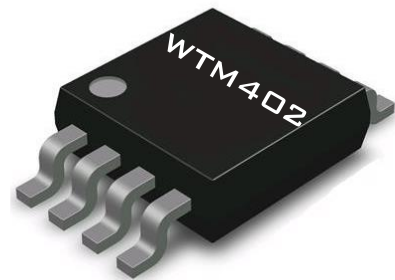
The WTM402 is designed a full-matched 50ohm MMIC mixer using high reliability GaAs FET process.

Features

- +29.7dBm Input IP3
- 9.6 dB Conversion Loss
- RF range: 1700~2700 MHz
- LO range: 1560~2840 MHz
- IF range: 50~300 MHz
- 35mA @+5V Supply/23mA @ +3.3V Supply
- 0 dBm LO drive level
- No External choke inductor

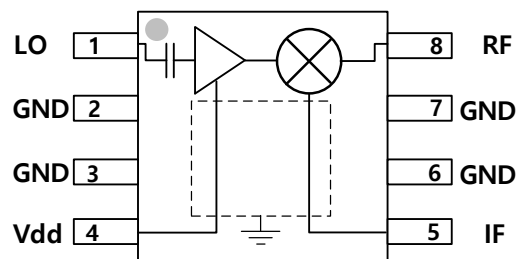
Applications

- Cellular / PCS / 3G / LTE repeaters
- Wireless Data / WLAN
- CATV & Cable Modem
- ISM band application
- Microwave Radio

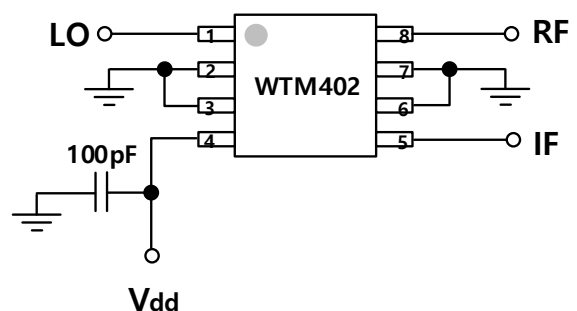


MSOP-8 Exposed Pad Package

Functional Block Diagram



Typical Application Configuration



Preliminary

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Absolute Maximum Ratings

Parameter	Rating
Supply Voltage(V _D)	6.0 V
Max Device Current(I _D)	60 mA
Max IF/RF Input Power	25 dBm
Max LO Drive Input Power	10 dBm
Operating Temperature(T _L)	-40 to +105°C
Storage Temperature	-65 to +150°C
ESD Sensitivity(HMB)	Class 1B
Moisture Sensitivity Level	MSL2



Typical Performance

Parameter	3.3V			5.0V			Units
	1.8	2.1	2.6	1.8	2.1	2.6	
Frequency range RF	1.8	2.1	2.6	1.8	2.1	2.6	GHz
Frequency range LO	1.56~1.94	1.86~2.24	2.36~2.74	1.56~1.94	1.86~2.24	2.36~2.74	GHz
Frequency range IF	50 ~ 300			50 ~ 300			MHz
Conversion Loss	10.1	9.2	9.9	10.6	9.4	10.0	dB
LO to RF Isolation	11.0	8.8	8.7	7.9	5.7	6.6	dB
LO to IF Isolation	16.6	22.6	31.3	13.4	19.2	30.1	dB
RF to IF Isolation	14.2	21.7	23.7	14.0	21.1	23.4	dB
Input IP3	29.3	29.7	29.1	34.6	28.3	28.0	dBm
Input P1dB	21	22	19	19	20	21	dBm
Supply current	21.2	23.5	27.5	32.5	35.3	43.7	mA

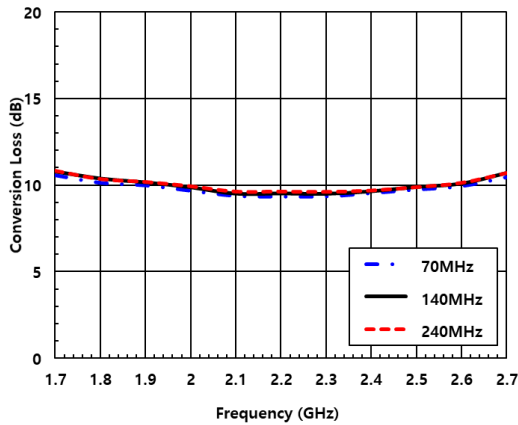
Input IP₃ Test Condition : Tone Spacing=1MHz, RF Input power = 0 dBm/ tone, LO driver = 0dBm, T_L=25°C, Z_s=Z_L=50, IF Freq.=70MHz, Converting with low-side LO Freq.

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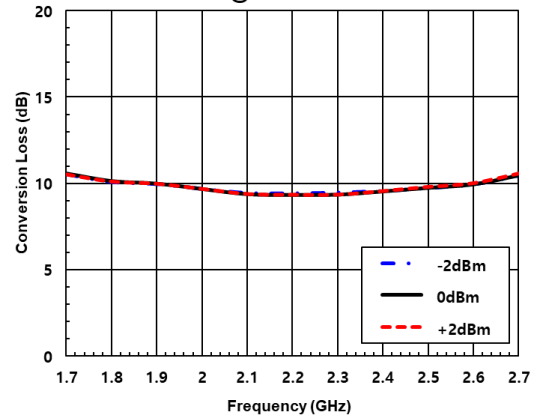
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Down conversion Performance @Vdd=3.3V Supply

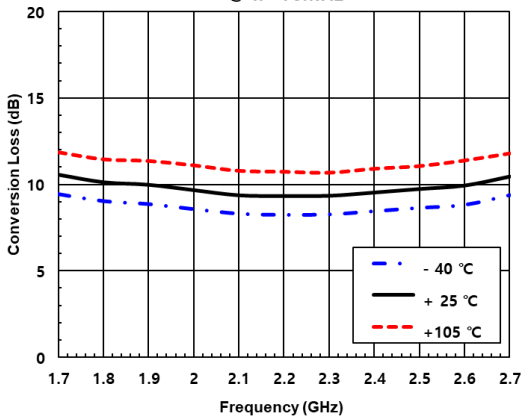
Conversion Loss vs RF Freq. vs IF Freq.



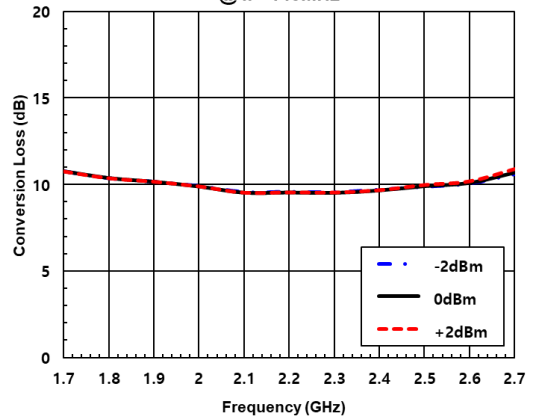
Conversion Loss vs RF Freq. vs LO Power @ IF=70MHz



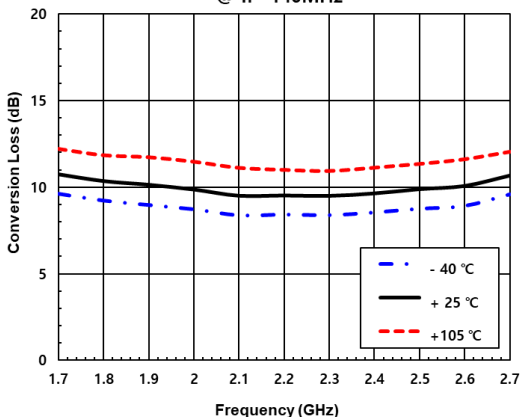
Conversion Loss vs RF Freq. vs Temp. @ IF=70MHz



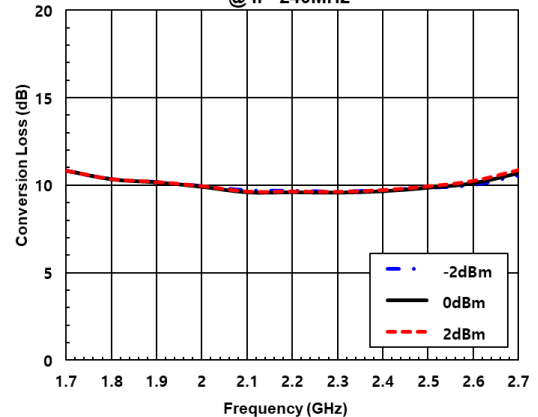
Conversion Loss vs RF Freq. vs LO Power @ IF=140MHz



Conversion Loss vs RF Freq. vs Temp. @ IF=140MHz



Conversion Loss vs RF Freq. vs LO Power @ IF=240MHz

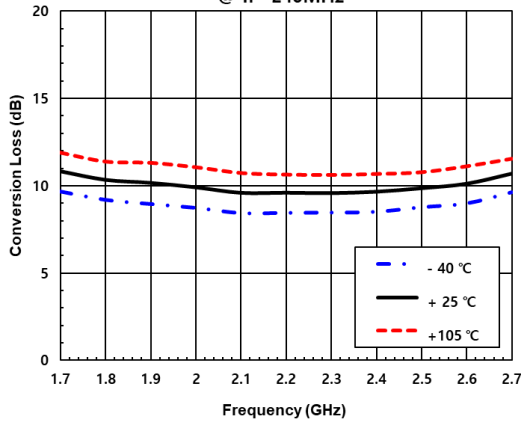


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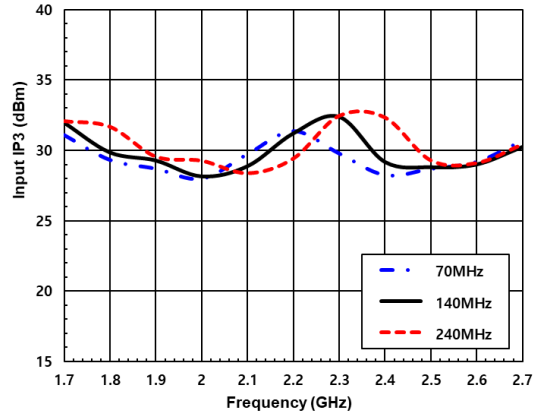
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Down conversion Performance @Vdd=3.3V Supply

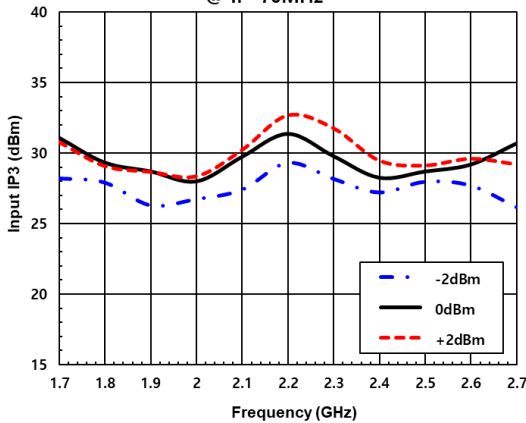
Conversion Loss vs RF Freq. vs Temp.
@ IF=240MHz



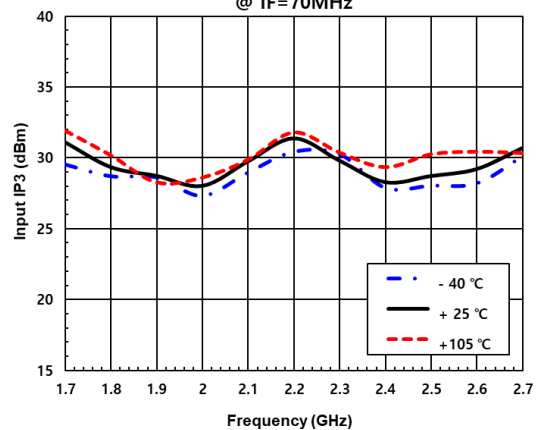
Input IP3 vs RF Freq. vs IF Freq.



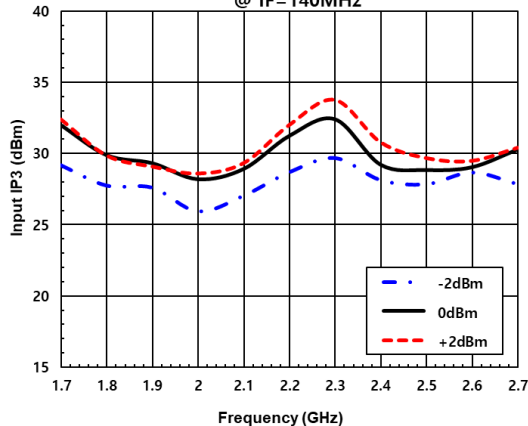
Input IP3 vs RF Freq. vs LO Power
@ IF=70MHz



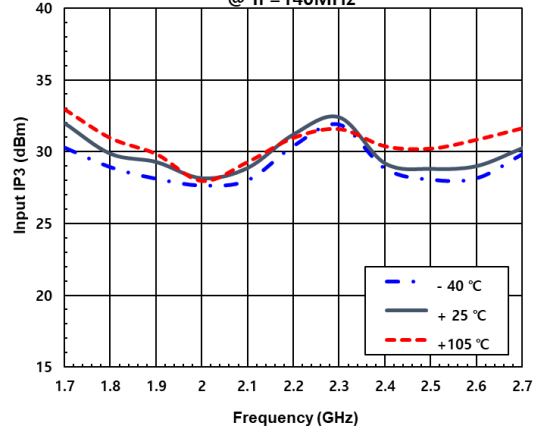
Input IP3 vs RF Freq. vs Temp.
@ IF=70MHz



Input IP3 vs RF Freq. vs LO Power
@ IF=140MHz



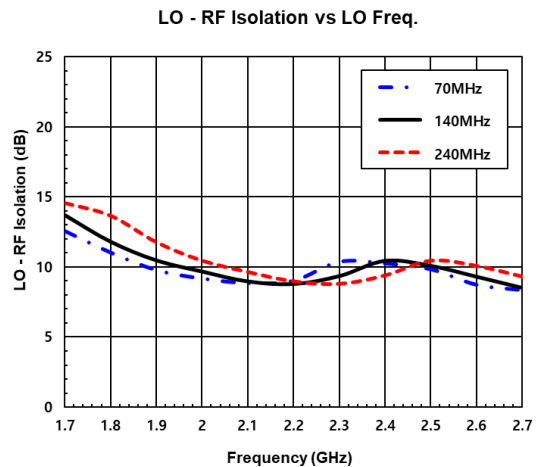
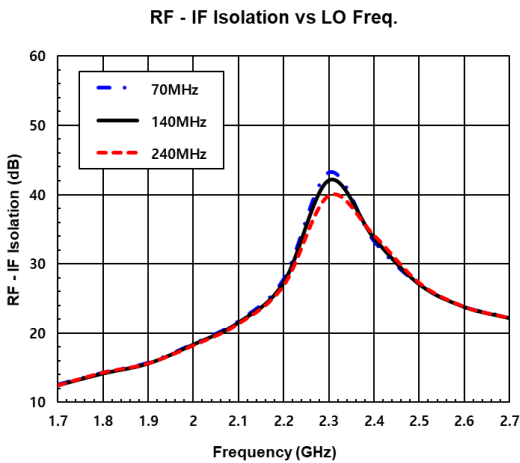
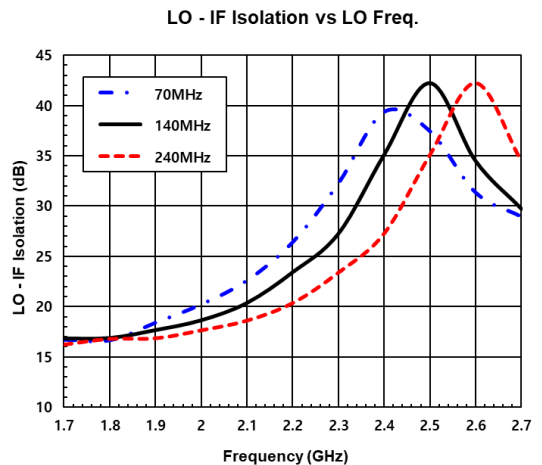
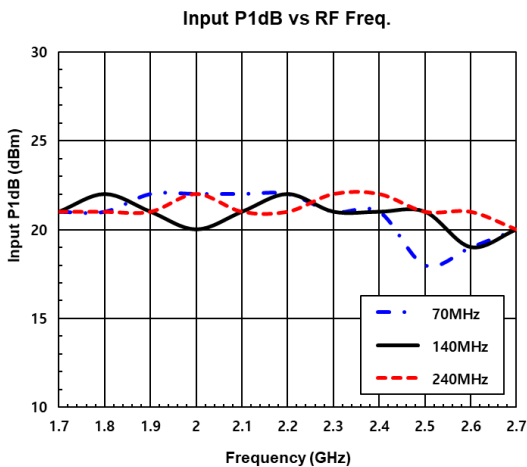
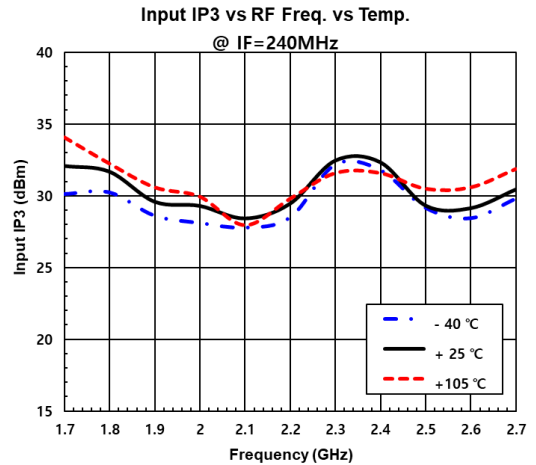
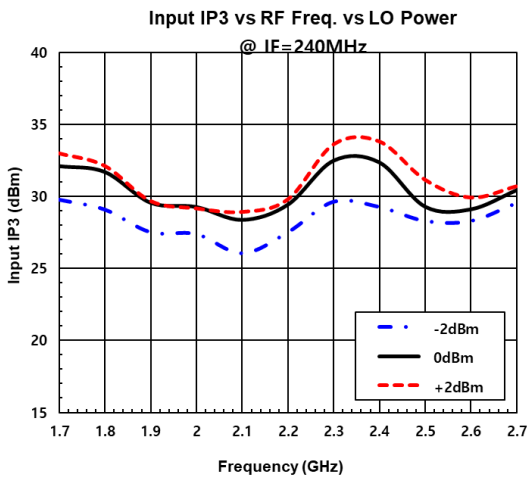
Input IP3 vs RF Freq. vs Temp.
@ IF=140MHz



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High IIP3 GaAs MMIC Mixer with Integrated LO amplifier 1700~2700MHz

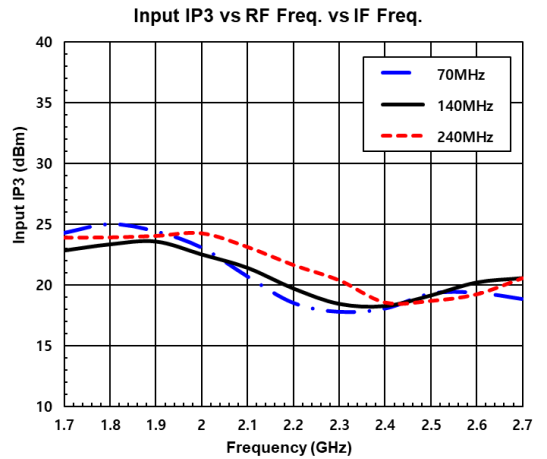
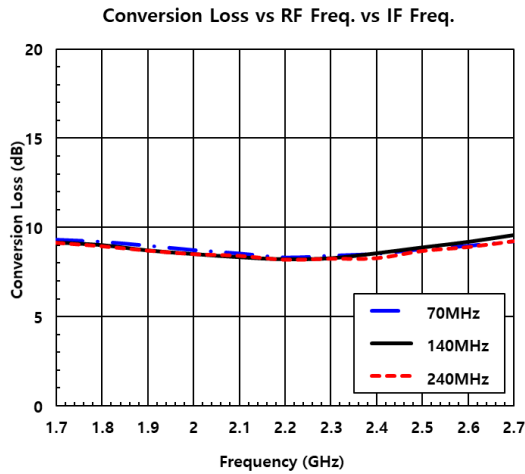
Down conversion Performance @Vdd=3.3V Supply



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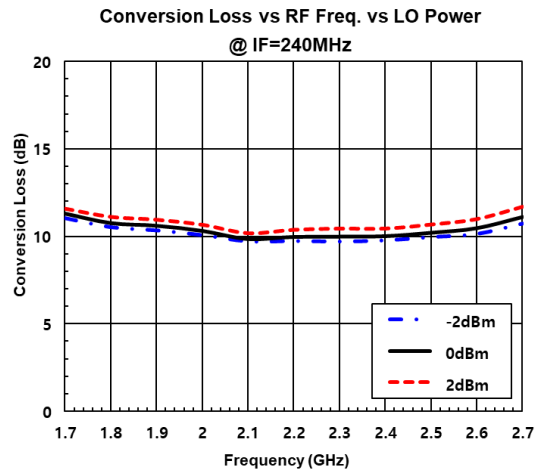
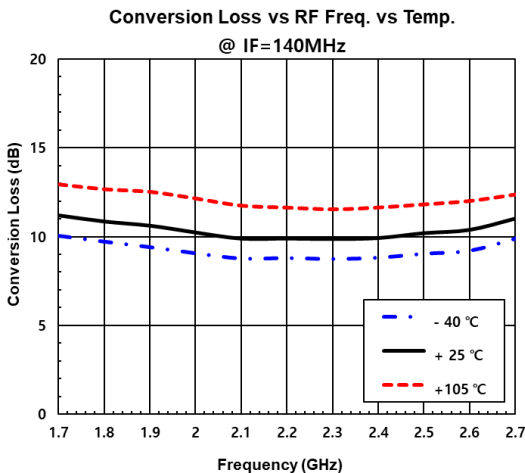
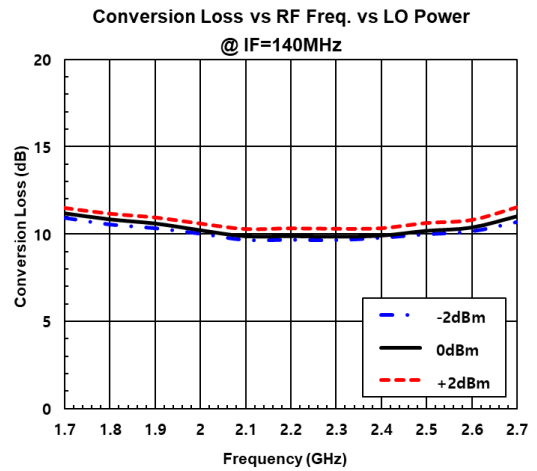
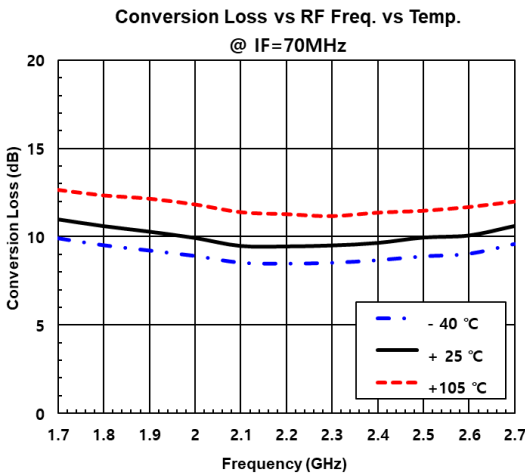
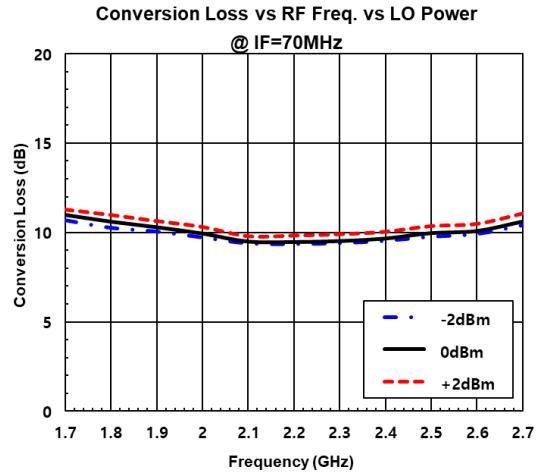
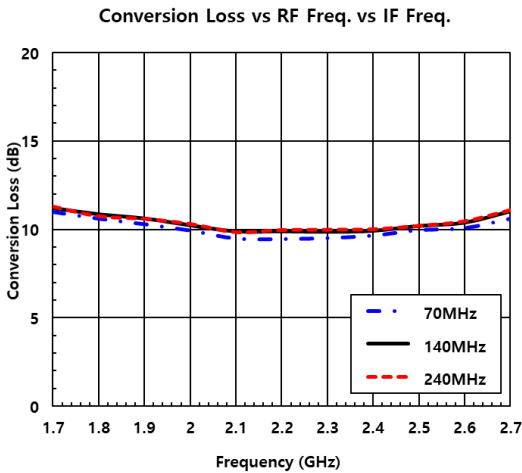
Up conversion Performance @Vdd=3.3V Supply



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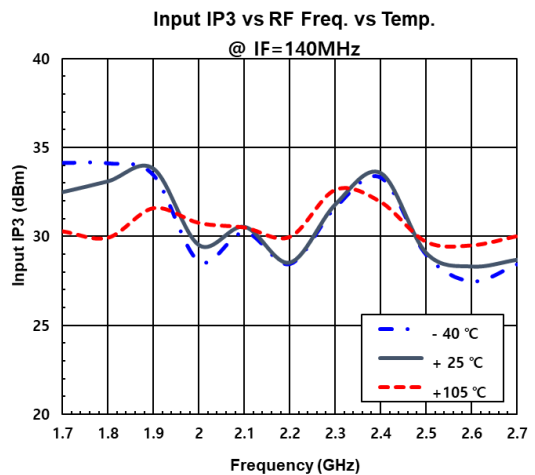
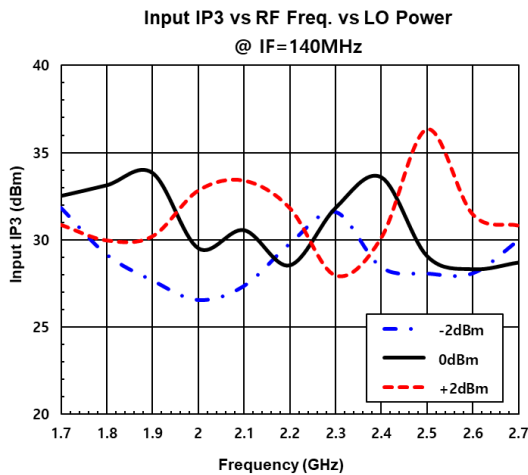
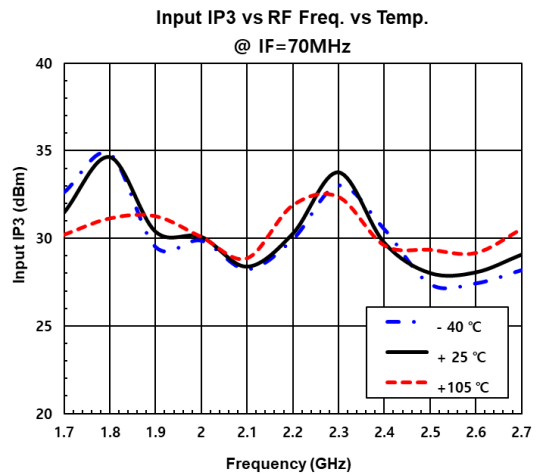
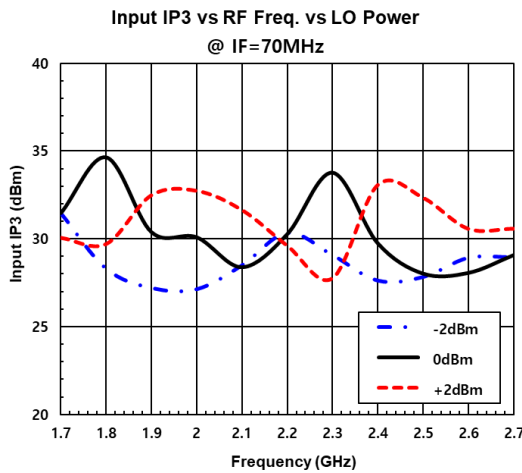
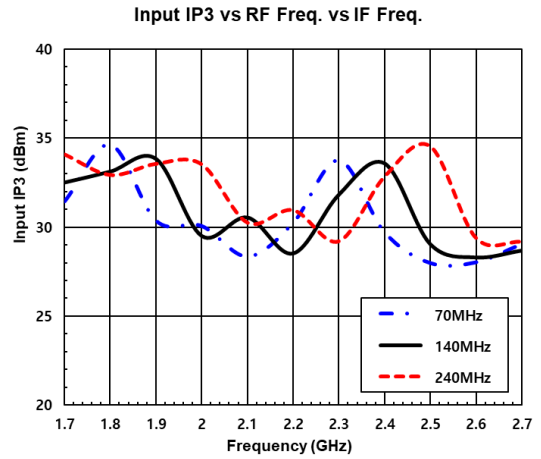
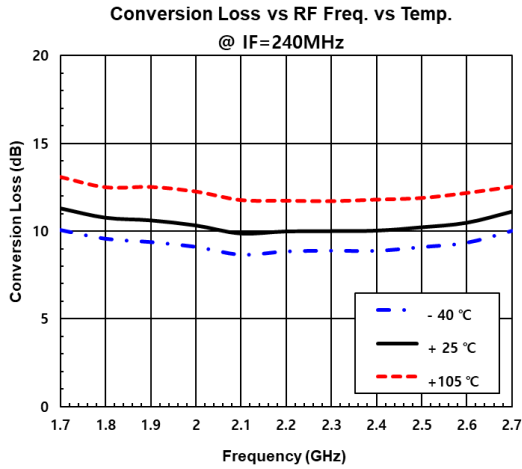
Down conversion Performance @Vdd=5V Supply



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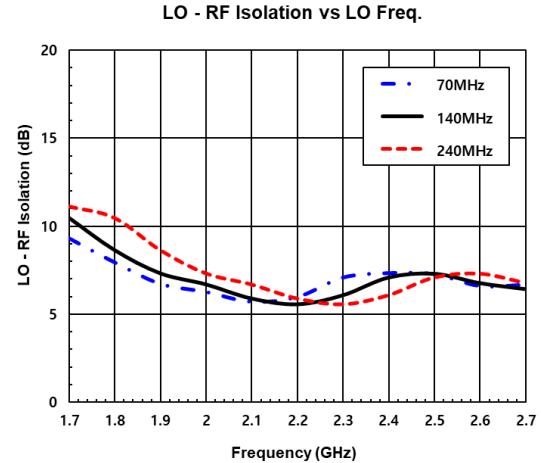
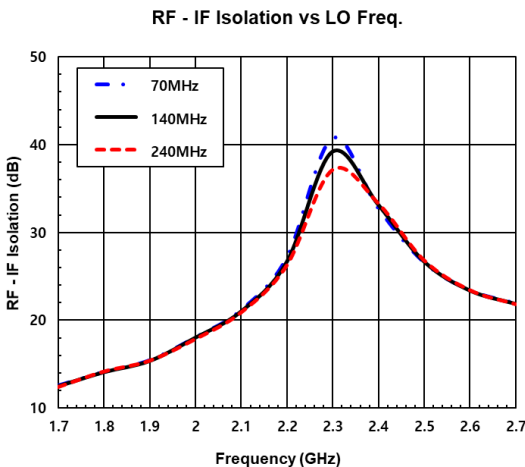
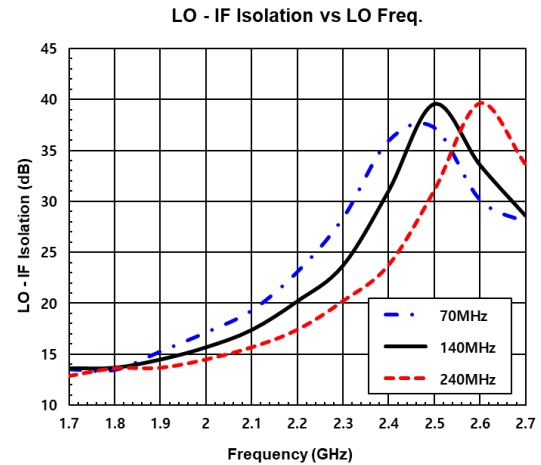
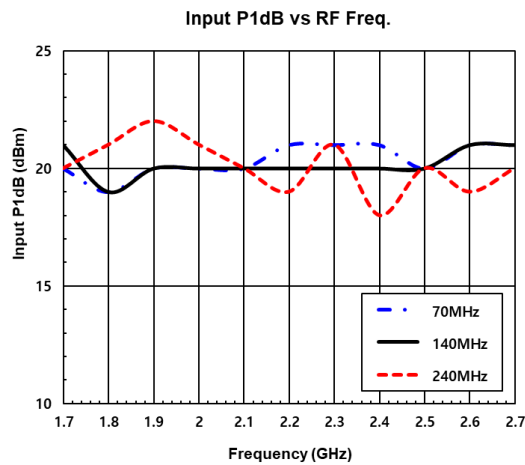
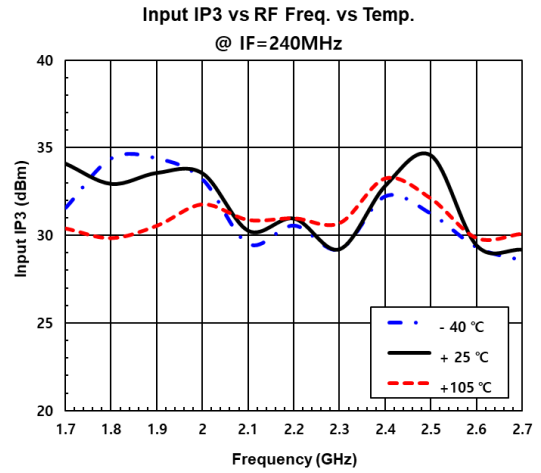
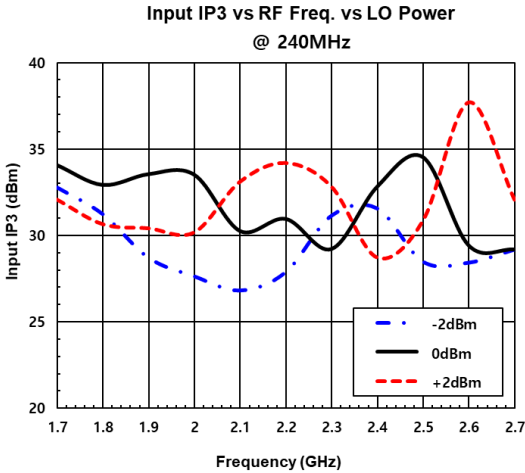
Down conversion Performance @Vdd=5V Supply



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Down conversion Performance @Vdd=5V Supply

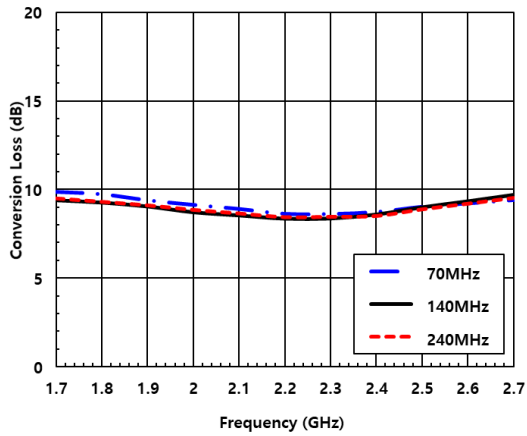


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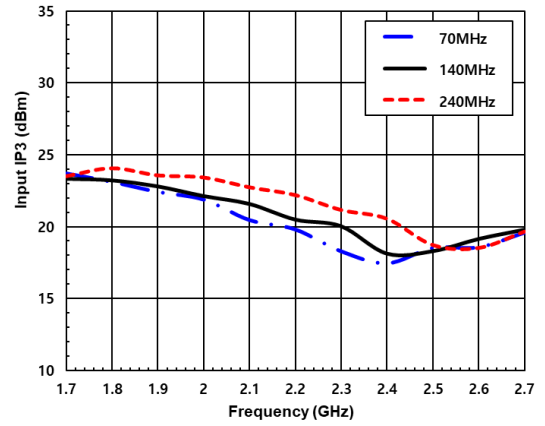
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Up conversion Performance @Vdd=5V Supply

Conversion Loss vs RF Freq. vs IF Freq.



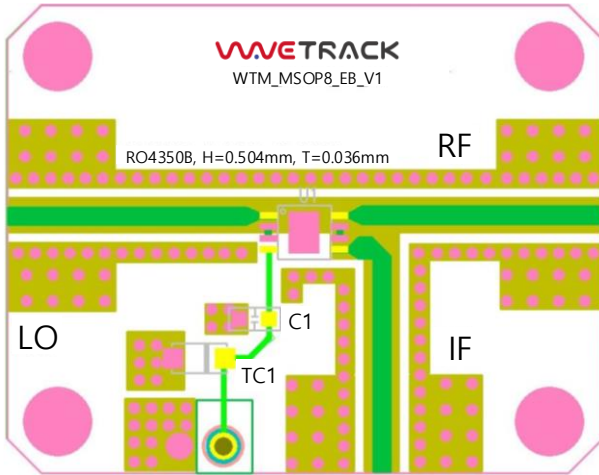
Input IP3 vs RF Freq. vs IF Freq.



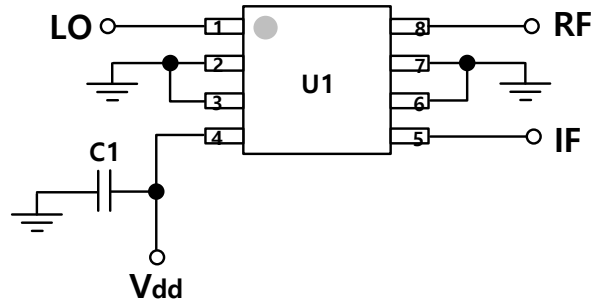
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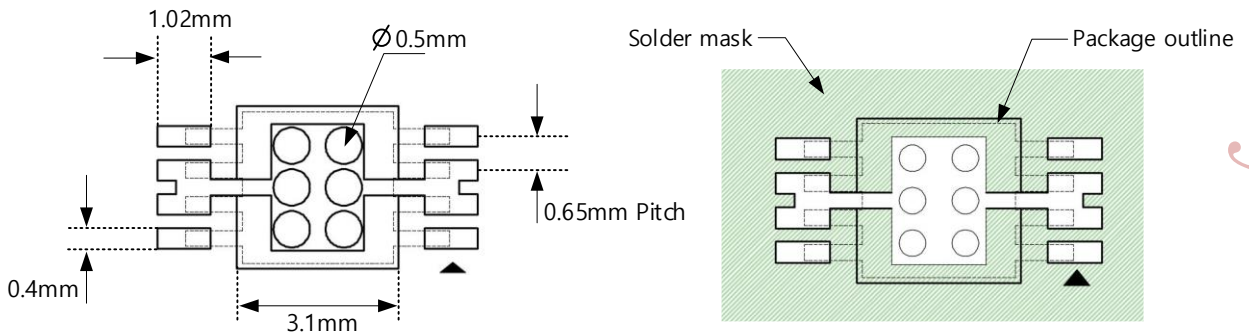
PCB layout and Reference design



Eval. PCB layout
(Rogers RO4350B, H=0.504mm, T=1/2 oz)



Reference Design



Mounting Configuration

Bill of Material

Reference	Value	Description	Manufacture
U1	WTM401	RF Mixer MMIC	WAVETRACK
C1	100 [pF]	Cap. Chip 0402, 5%, 10V	Samsung
TC1	10[uF]	Tantalum Capacitor	Samsung

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Package Dimension & Marking

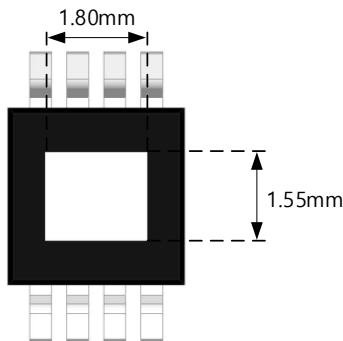
- Marking : Manufacture

Part Number – W402S1

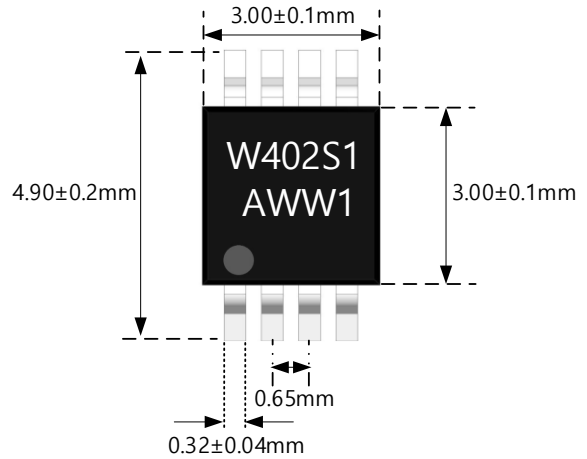
Lot code – AWW1

A = Year / WW = Working Week / 1 = Wafer No.

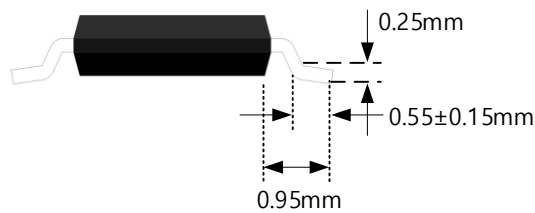
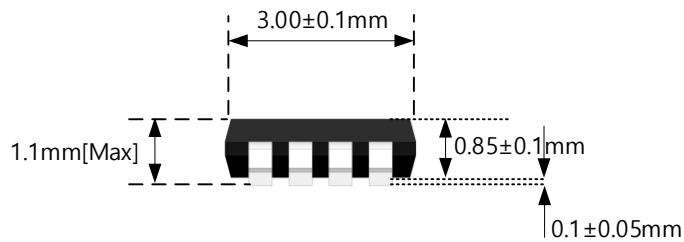
- Dimension : Millimeters



Bottom Exposed pad Dimension



Top Dimension



Side Dimension