

High IIP3 GaAs MMIC Mixer with Integrated LO amplifier 700~1400MHz

General Description

The WTM401 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 700MHz to 1500MHz frequency range to achieve +31dBm Input IP3 while drawing a very low 42mA on 5V and 23mA on 3.3V.

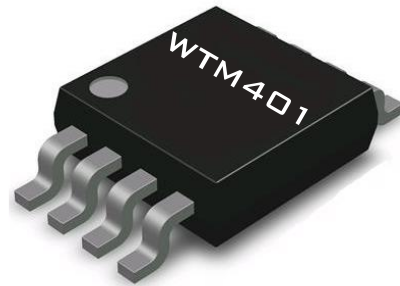
The WTM401 is designed a full-matched 50ohm MMIC mixer using high reliability GaAs FET process.

Features

- +33.1dBm Input IP3
- 10.2 dB Conversion Loss
- RF range: 700~1400 MHz
- LO range: 600~1600 MHz
- IF range: 50~300 MHz
- 38mA @+5V Supply/24mA @ +3.3V Supply
- 0 dBm LO drive level
- No External choke inductor
- Very High LO to RF isolation

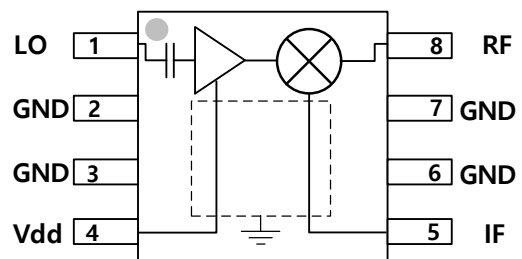
Applications

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

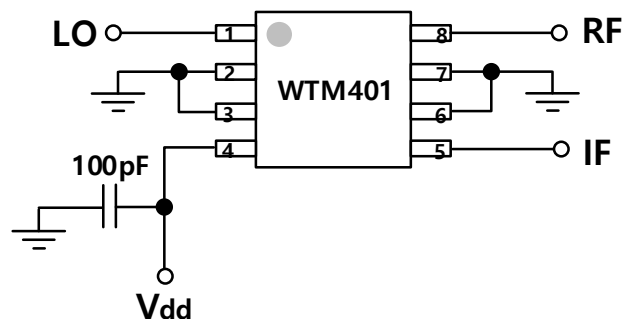


MSOP-8 Exposed Pad Package

Functional Block Diagram



Typical Application Configuration



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Absolute Maximum Ratings

| Parameter | Rating |
|--|---------------|
| Supply Voltage(V _D) | 5.5 V |
| Max Device Current(I _D) | 70 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 1A |
| Moisture Sensitivity Level | MSL2 |



Typical Performance

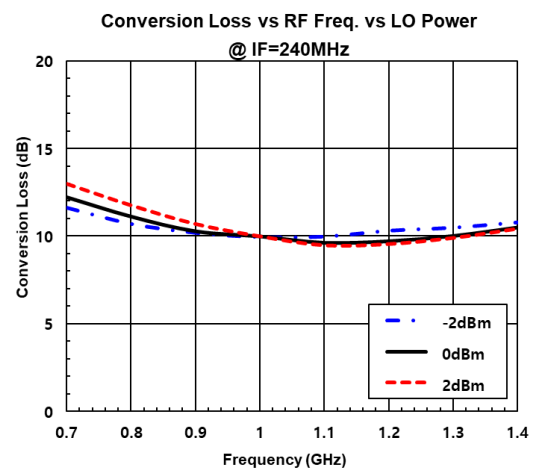
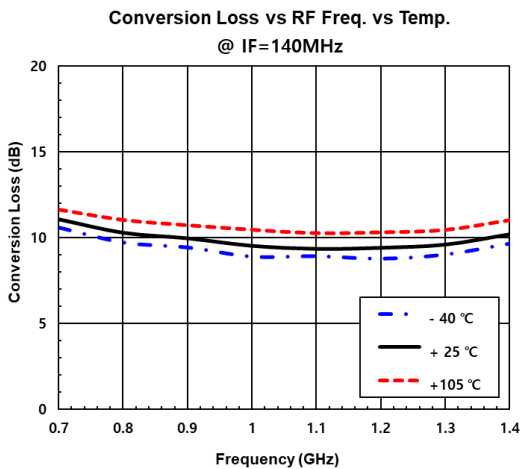
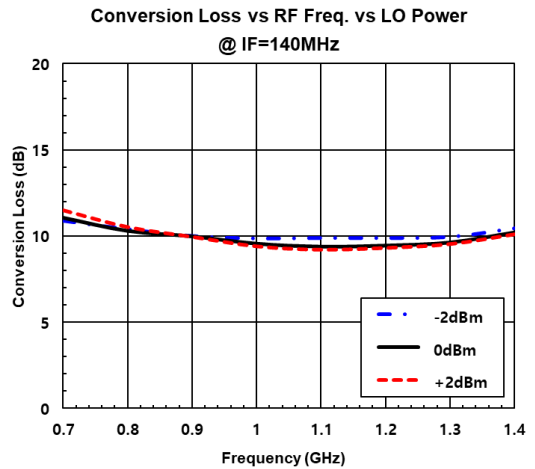
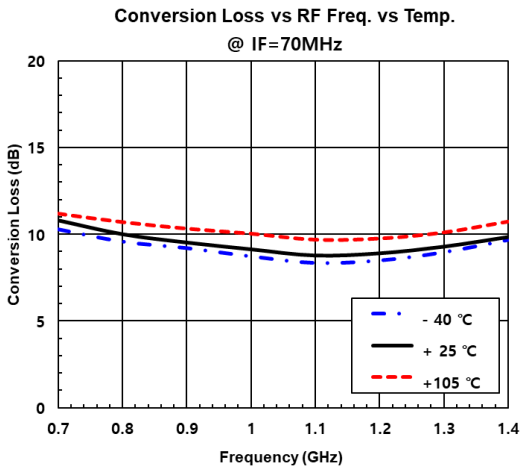
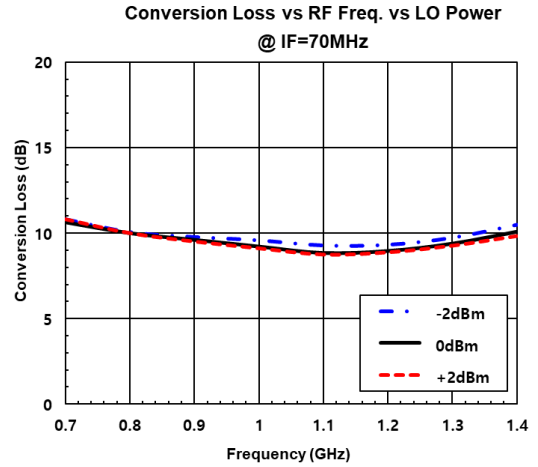
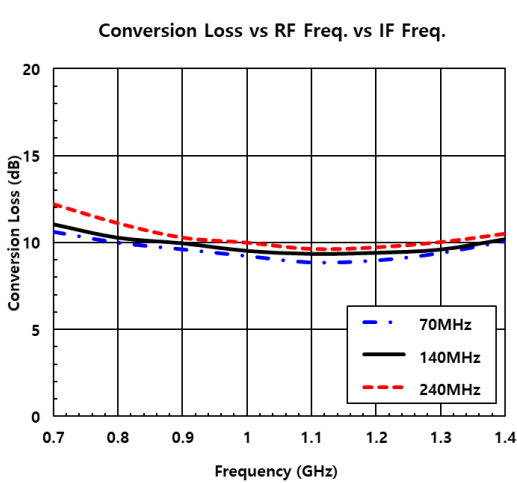
| Parameter | 3.3V | | | 5.0V | | | Units |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
| | 0.8 | 1.0 | 1.3 | 0.8 | 1.0 | 1.3 | |
| Frequency range RF | 0.8 | 1.0 | 1.3 | 0.8 | 1.0 | 1.3 | GHz |
| Frequency range LO | 0.56~0.94 | 0.76~1.14 | 1.06~1.44 | 0.56~0.94 | 0.76~1.14 | 1.06~1.44 | GHz |
| Frequency range IF | 50 ~ 300 | | | 50 ~ 300 | | | MHz |
| Conversion Loss | 9.9 | 9.2 | 8.9 | 10.0 | 9.2 | 9.3 | dB |
| LO to RF Isolation | 18.1 | 15.4 | 13.1 | 15.5 | 14.0 | 11.3 | dB |
| LO to IF Isolation | 26.8 | 24.1 | 22.6 | 22.4 | 21.1 | 20.2 | dB |
| RF to IF Isolation | 21.7 | 28.7 | 37.0 | 21.5 | 27.1 | 35.7 | dB |
| Input IP ₃ | 33.1 | 26.0 | 28.9 | 28.6 | 24.7 | 29.2 | dBm |
| Input P _{1dB} | 19 | 19 | 19 | 21 | 22 | 22 | dBm |
| Supply current | 24.0 | 22.6 | 22.9 | 38.3 | 37.6 | 38.0 | 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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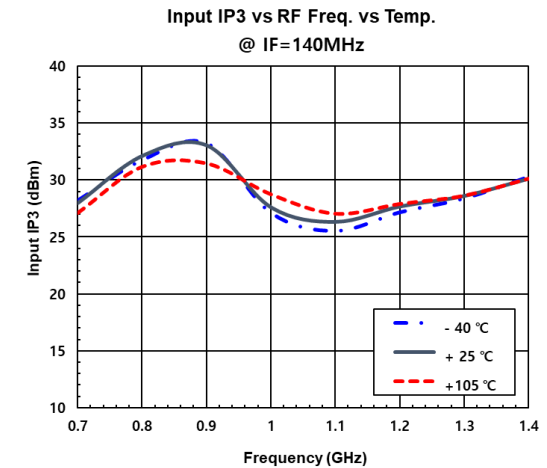
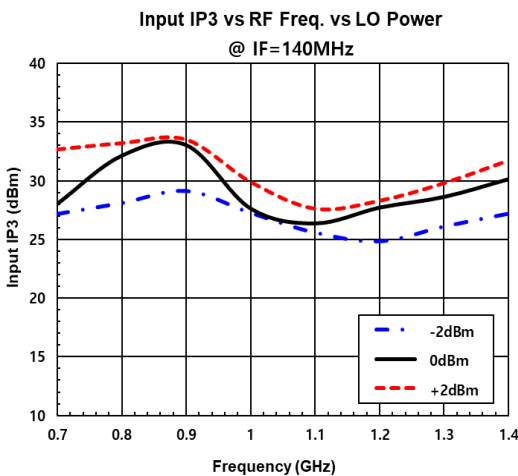
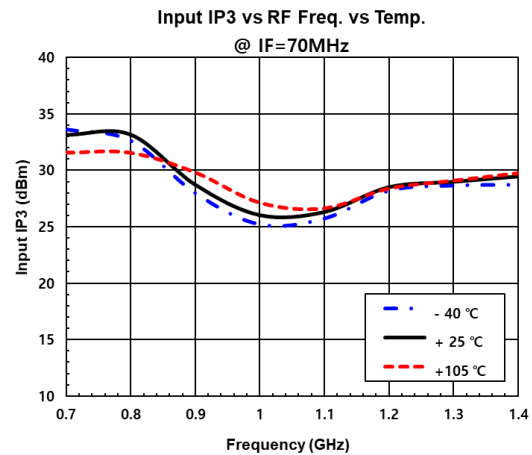
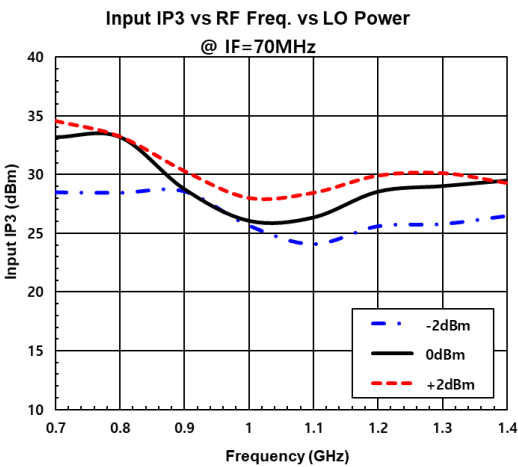
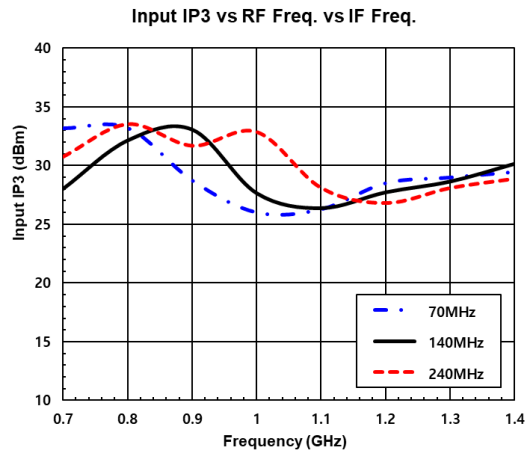
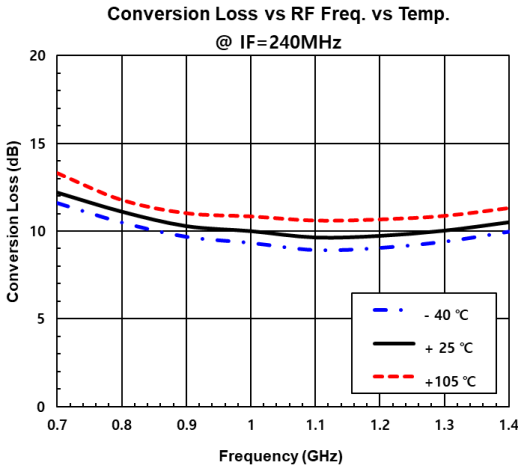
Down conversion Performance @Vdd=3.3V Supply



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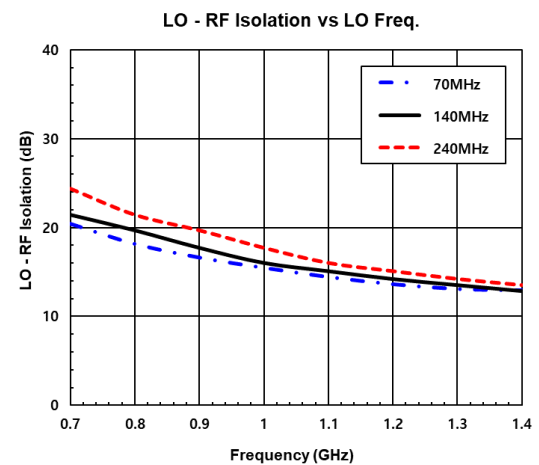
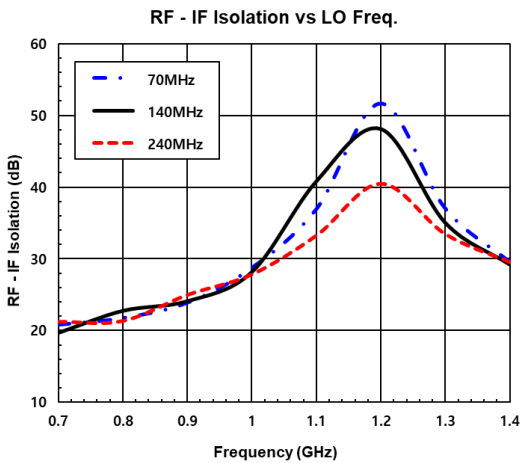
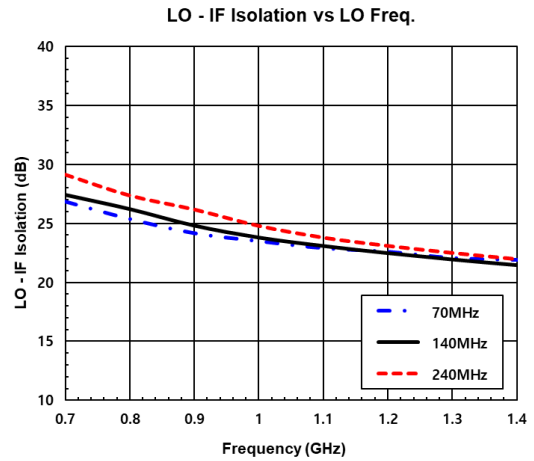
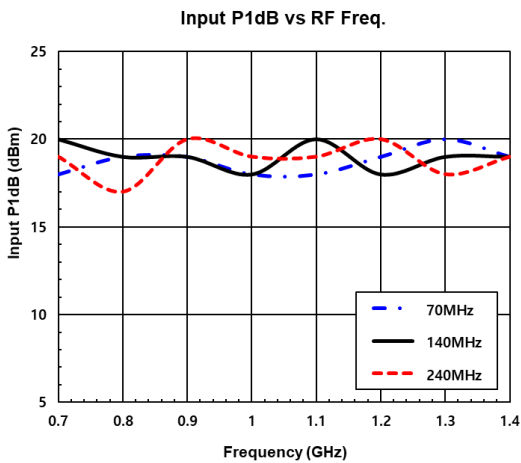
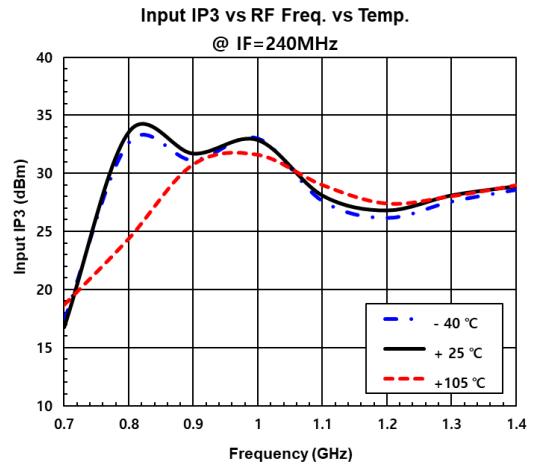
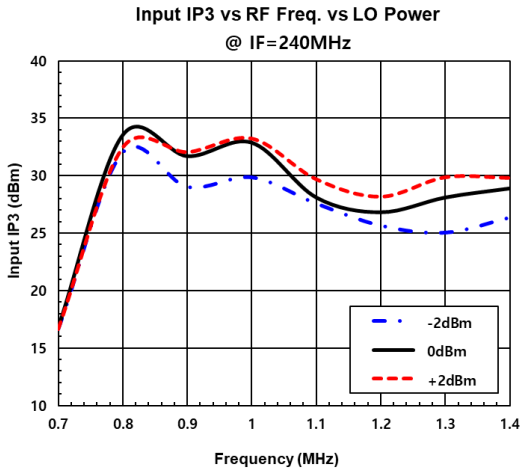
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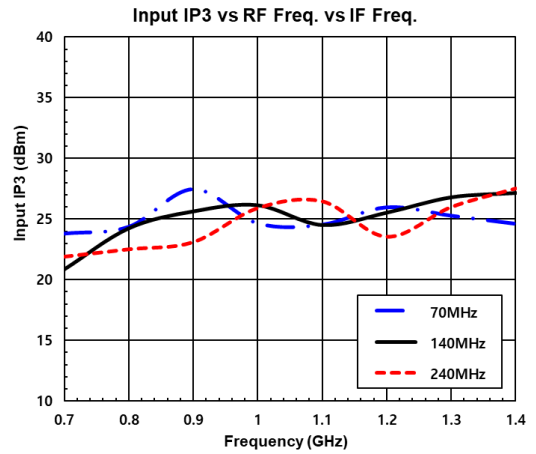
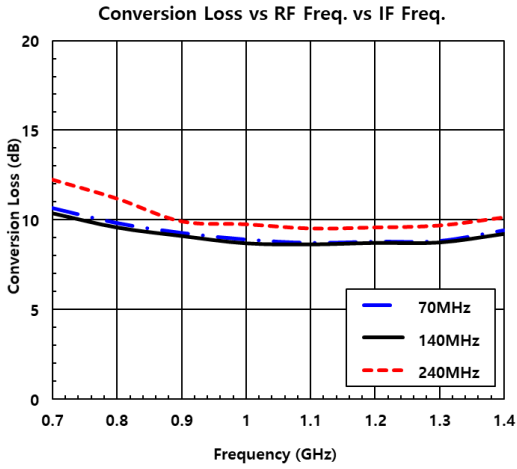
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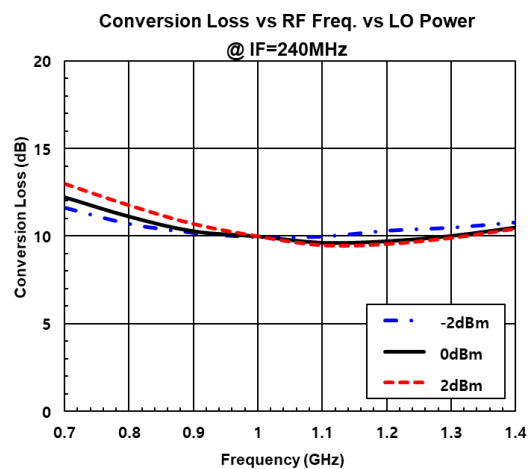
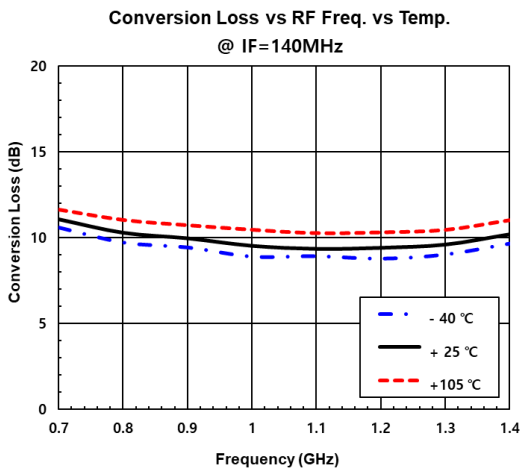
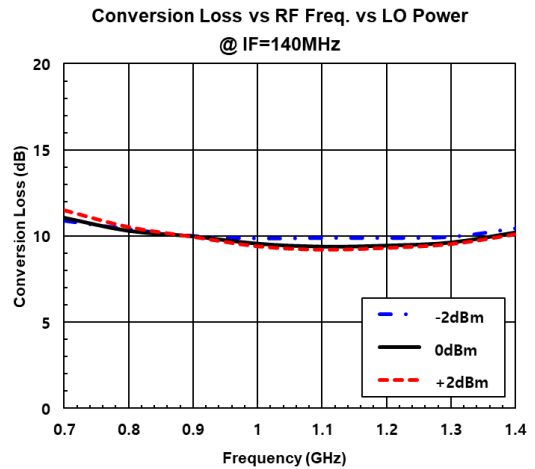
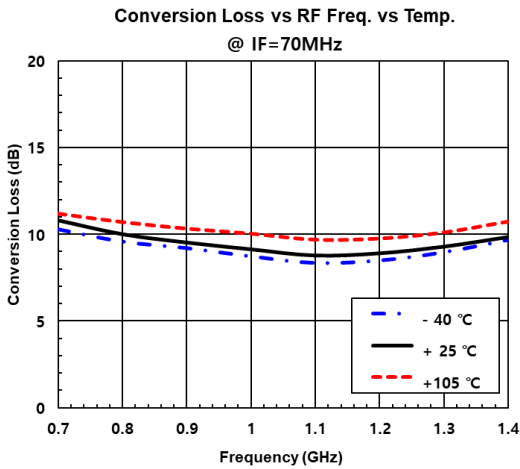
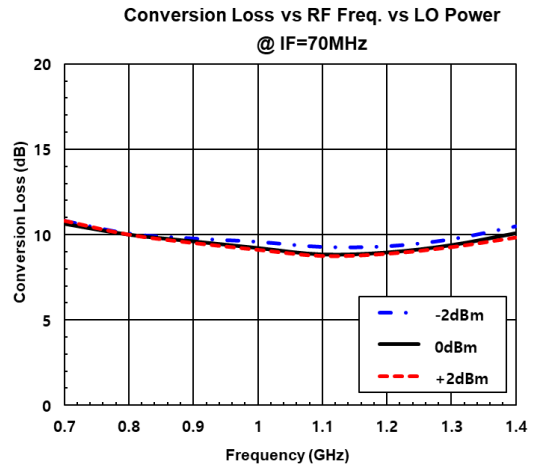
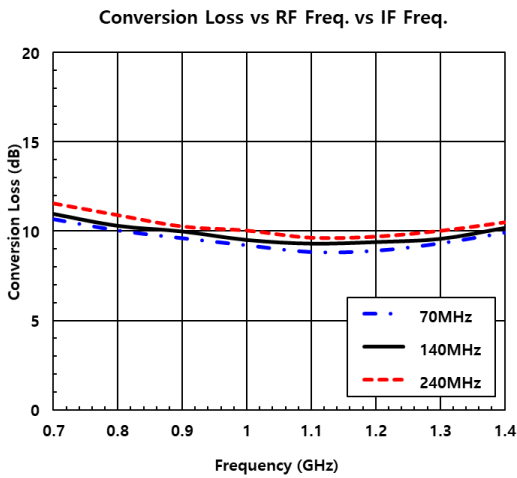
Up conversion Performance @Vdd=3.3V Supply



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Down conversion Performance @V_{dd}=5V Supply

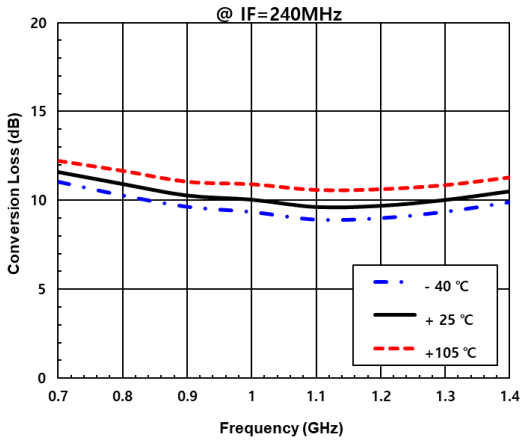


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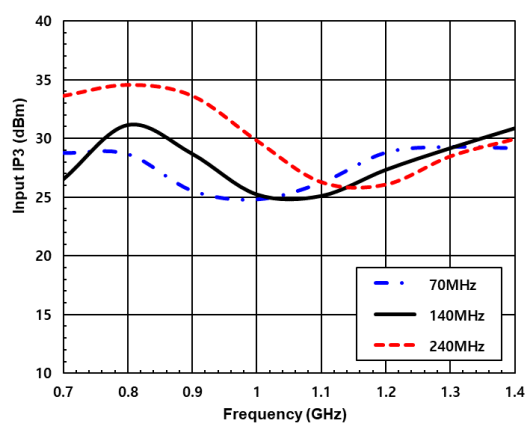
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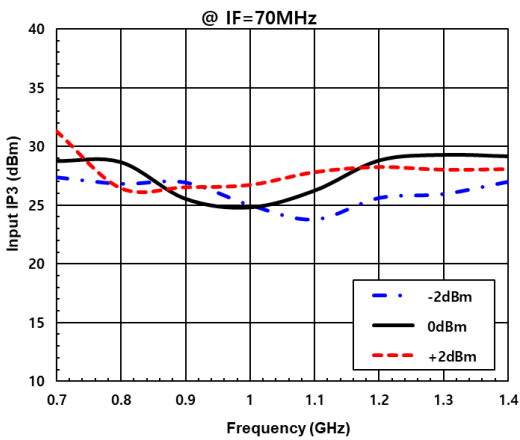
Conversion Loss vs RF Freq. vs Temp.



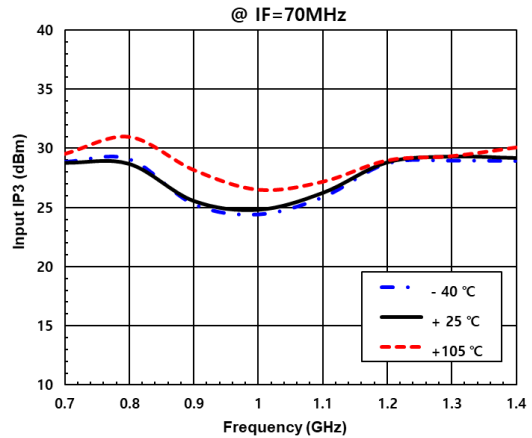
Input IP3 vs RF Freq. vs IF Freq.



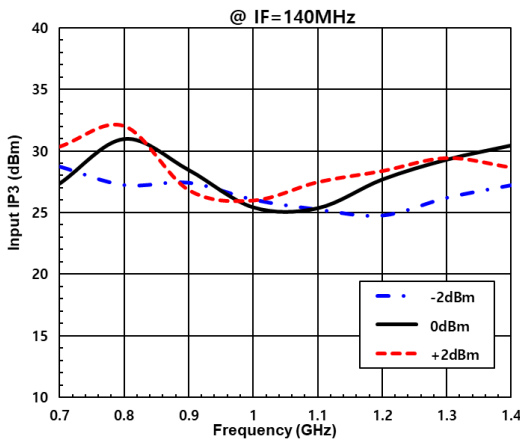
Input IP3 vs RF Freq. vs LO Power



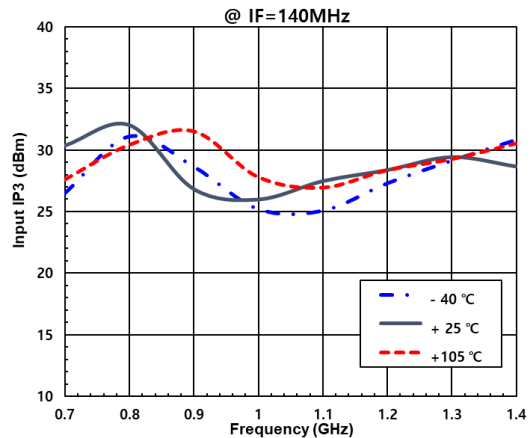
Input IP3 vs RF Freq. vs Temp.



Input IP3 vs RF Freq. vs LO Power



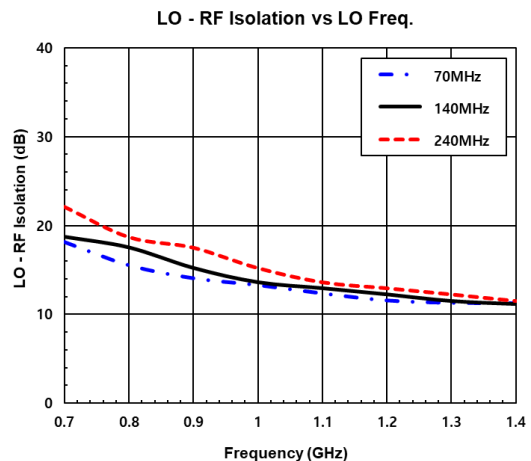
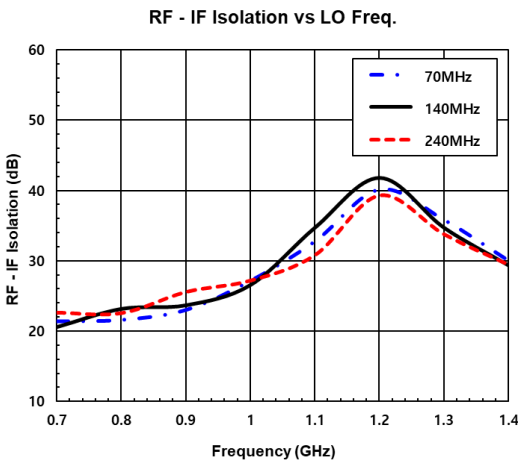
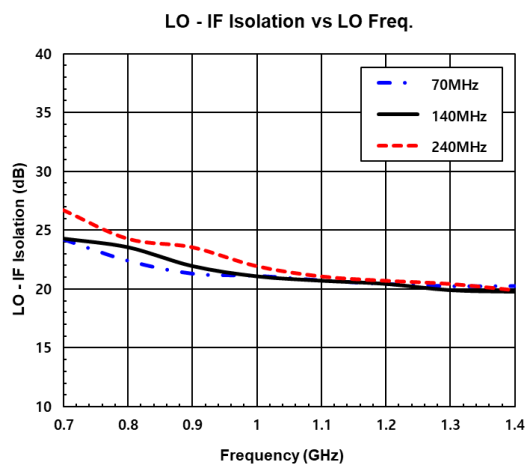
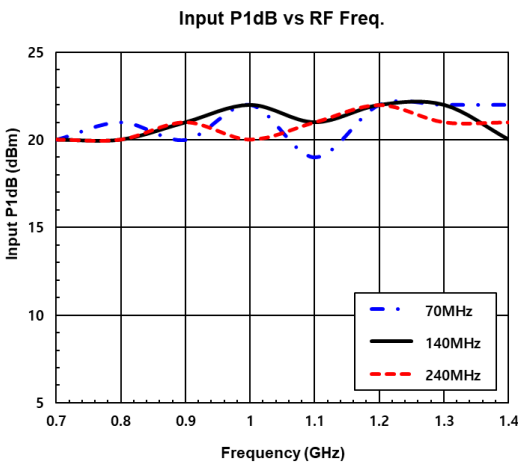
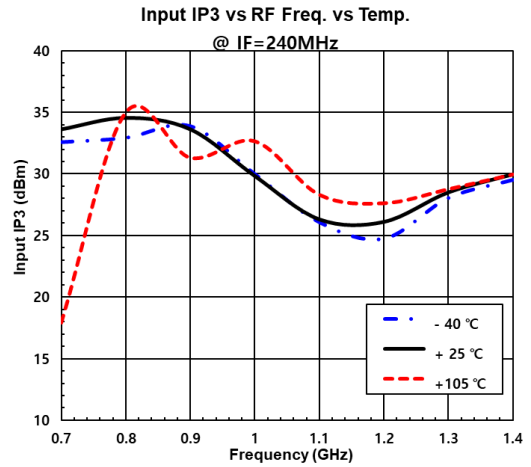
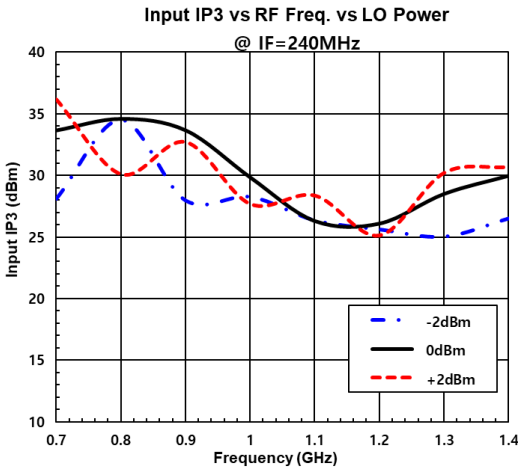
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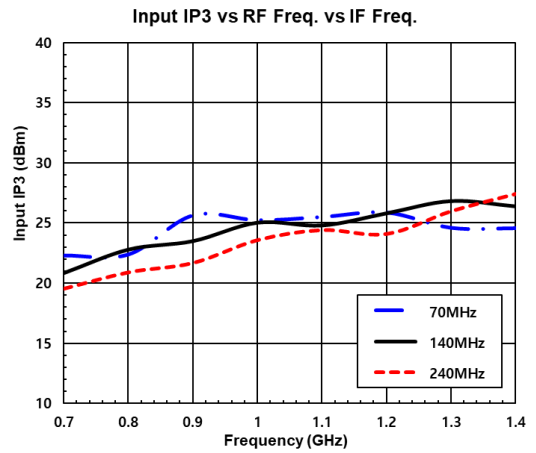
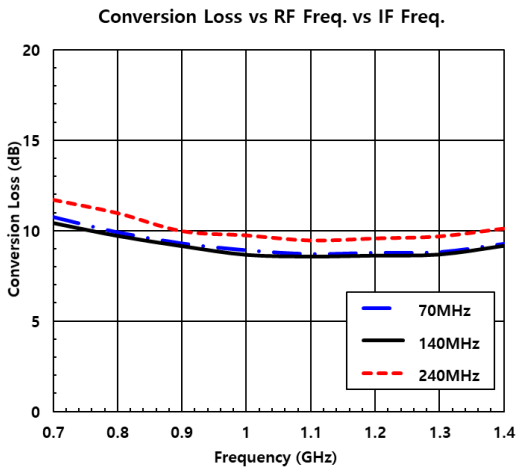
Down conversion Performance @Vdd=5V Supply



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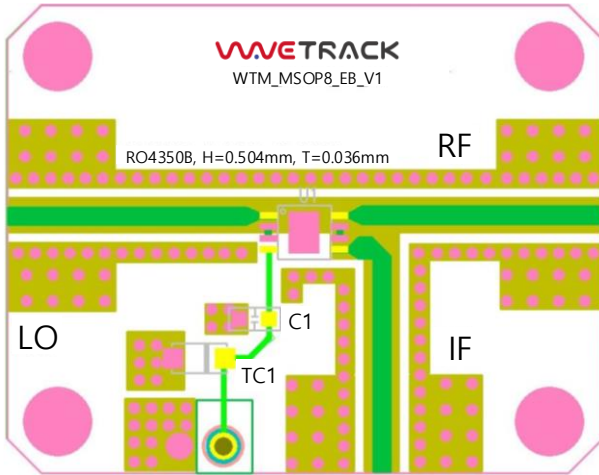
Up conversion Performance @Vdd=5V Supply



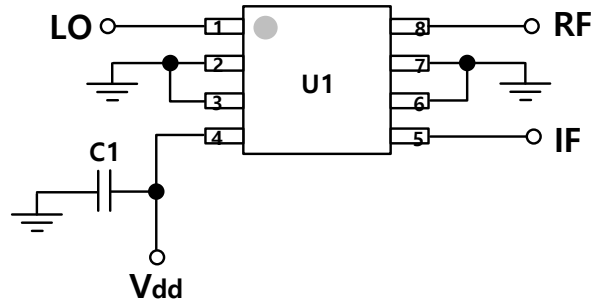
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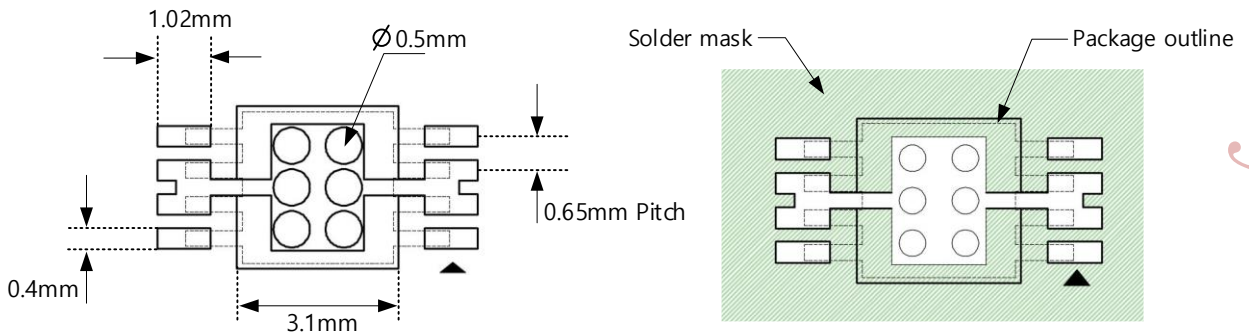
PCB layout and Reference design



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

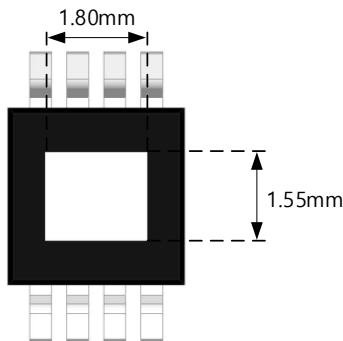
- Marking : Manufacture

Part Number – W401S3

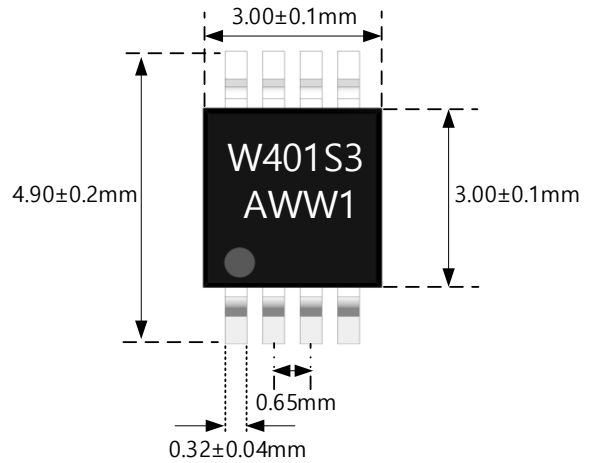
Lot code – AWW1

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

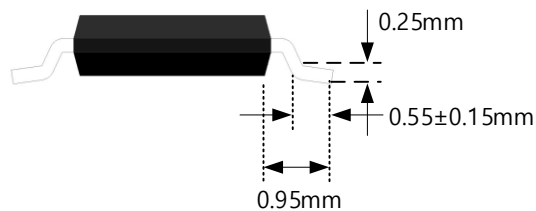
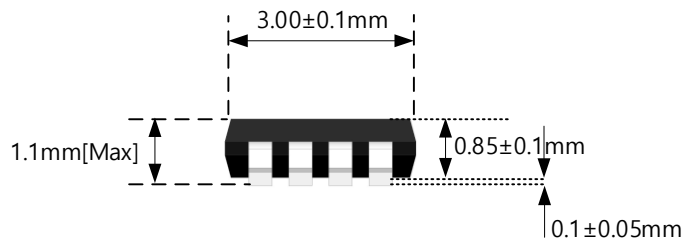
- Dimension : Millimeters



Bottom Exposed pad Dimension



Top Dimension



Side Dimension