



# MH103A

## High Dynamic Range UMTS-Band MMIC Mixer

The Communications Edge™

Product Information

### Product Features

- +34 dBm IIP3
- RF: 1900 – 2200 MHz
- LO: 1600 – 2150 MHz
- IF: 50 – 300 MHz
- +17 dBm Drive Level
- Lead-free/Green SOIC8 package
- No External Bias Required

### Applications

- Mobile Infrastructure

### Specifications <sup>(1)</sup>

| Parameter            | Units | Min | Typ         | Max | Comments      |
|----------------------|-------|-----|-------------|-----|---------------|
| RF Frequency Range   | MHz   |     | 1900 – 2200 |     |               |
| LO Frequency Range   | MHz   |     | 1600 – 2150 |     |               |
| IF Frequency Range   | MHz   |     | 50 – 300    |     |               |
| SSB Conversion Loss  | dB    |     | 8.2         | 9.0 | See note 1    |
| Noise Figure         | dB    |     | 8.7         |     | See note 2    |
| Input IP3            | dBm   | +28 | +34         |     | See note 1, 3 |
| Input P1dB           | dBm   |     | +16         |     |               |
| LO – RF Isolation    | dB    | 21  | 28          |     |               |
| LO – IF Isolation    | dB    | 27  | 37          |     |               |
| RF – IF Isolation    | dB    | 12  | 18          |     |               |
| Return Loss: RF Port | dB    |     | 15          |     |               |
| Return Loss: IF Port | dB    |     | 20          |     |               |
| Return Loss: LO Port | dB    |     | 12          |     |               |
| LO Drive Level       | dBm   |     | +17         |     |               |

1. Test conditions unless otherwise noted: RF / IF = 1900 / 50, 1900 / 200, 2200 / 50, and 2200 / 300 MHz with a low-side LO at +17 dBm in a downconverting application at 25° C.  
 2. Assumes LO injection noise is filtered at the thermal noise floor, -174 dBm/Hz, at the RF, IF, and Image frequencies.  
 3. IIP3 is measured with  $\Delta f = 1$  MHz with  $RF_{in} = 0$  dBm / tone.

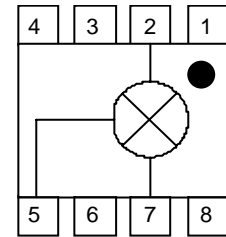
### Product Description

The MH103A is a passive GaAs MESFET mixer that provides high dynamic range performance in a low-cost lead-free/green/RoHS-compliant SOIC-8 package. WJ's MH103A uses patented techniques to realize +34 dBm Input IP3 at an LO drive level of +17 dBm.

This single monolithic integrated circuit does not require any external baluns, bias, matching, or decoupling elements. The on-chip diplexer affords good matching on the RF and IF ports.

Typical applications include frequency up/down conversion, modulation and demodulation for receivers and transmitters used in 3G UMTS systems.

### Functional Diagram



| Function | Pin No.       |
|----------|---------------|
| LO       | 2             |
| IF       | 5             |
| RF       | 7             |
| GND      | 1, 3, 4, 6, 8 |

### Absolute Maximum Rating

| Parameter                  | Rating         |
|----------------------------|----------------|
| Operating Case Temperature | -40 to +85 °C  |
| Storage Temperature        | -65 to +100 °C |
| LO Power                   | +20 dBm        |
| Input IF / RF Power        | +20 dBm        |

Operation of this device above any of these parameters may cause permanent damage.

### Ordering Information

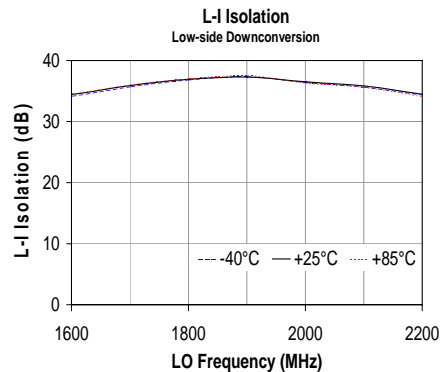
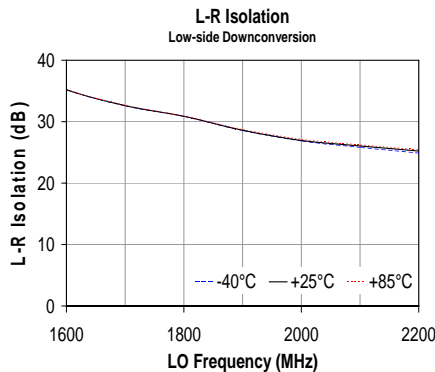
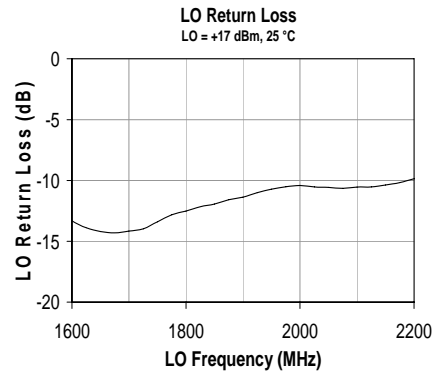
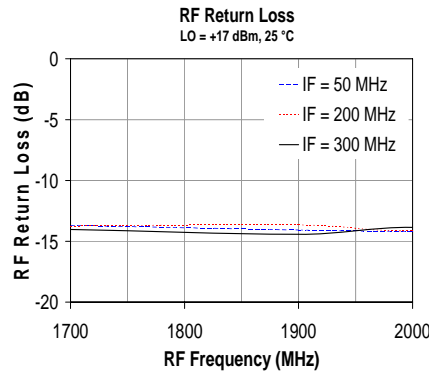
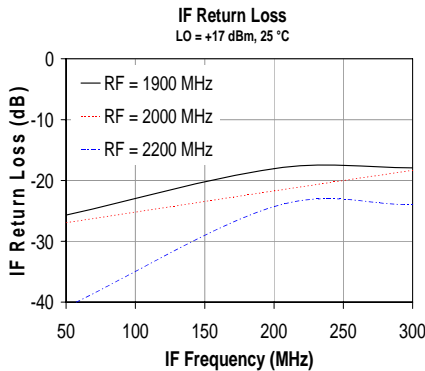
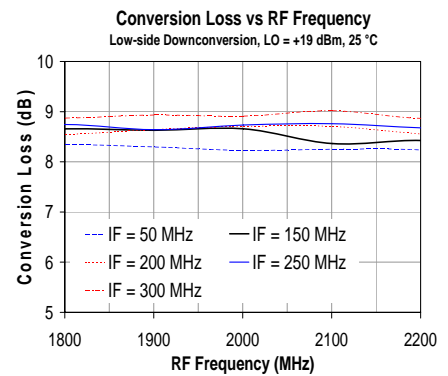
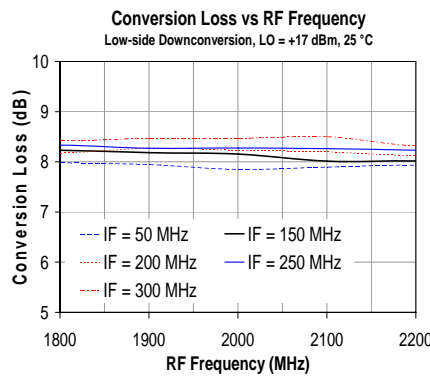
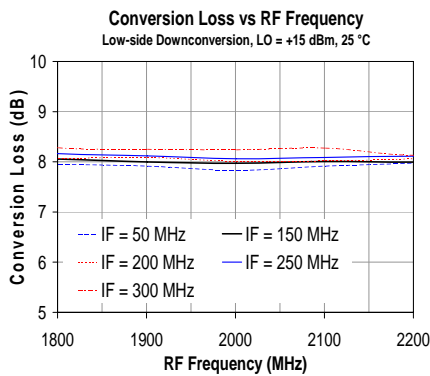
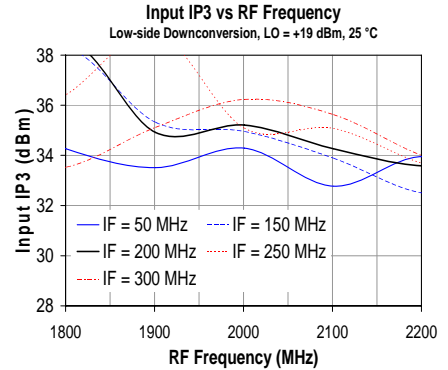
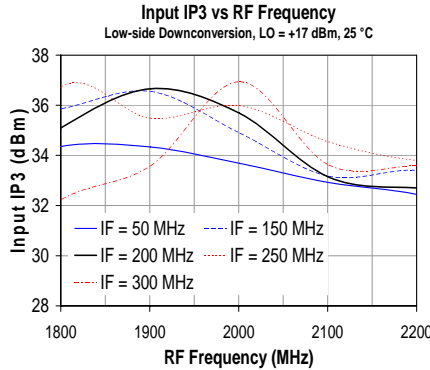
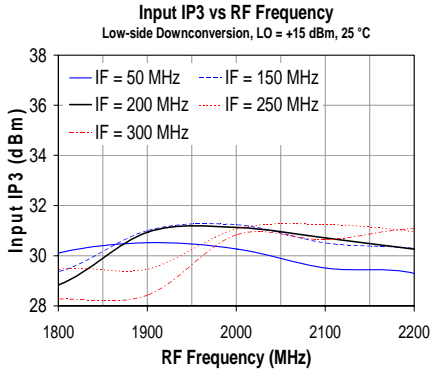
| Part No.   | Description   |
|------------|---|
| MH103A*    | High Dynamic Range UMTS-band MMIC Mixer (lead-tin SOIC-8 package)                       |
| MH103A-G   | High Dynamic Range UMTS-band MMIC Mixer (lead-free/green/RoHS-compliant SOIC-8 package) |
| MH103A-PCB | Fully-Assembled Mixer Application Board   |

\* This package is being phased out in favor of the green package type which is backward compatible for existing designs.

Specifications and information are subject to change without notice

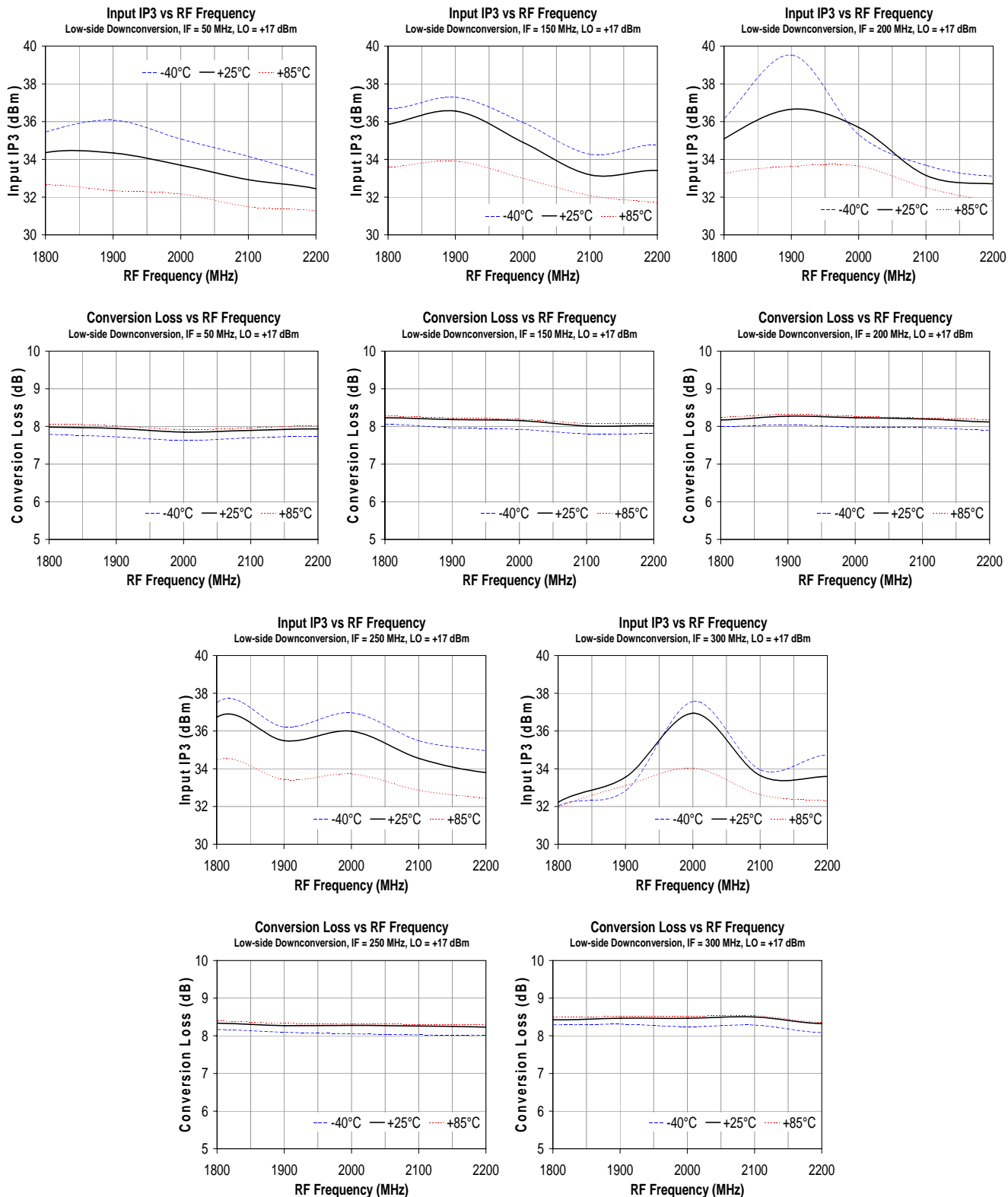


## Typical Performance Plots: Low-side Downconversion





## Typical Performance Plots over Temperature: Low-side Downconversion





# MH103A

High Dynamic Range UMTS-Band MMIC Mixer

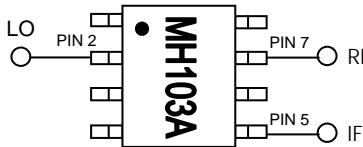
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Product Information

## MH103A (SOIC-8 Package) Mechanical Information

This package may contain lead-bearing materials. The plating material on the leads is SnPb.

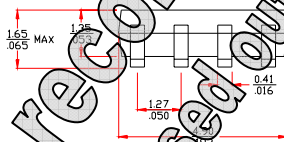
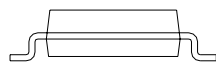
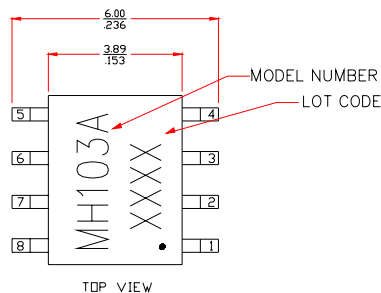
### Application Circuit (MH103A-PCB)



#### Notes:

1. All other pins on mixer are grounded.
2. Circuit board material: .014" FR-4, 4 layers, .062" total thickness
3. Blocking capacitors are required on the ports (pins 2, 5, 7) if any dc signal is present.

### Outline Drawing



### Product Marking

The component will be marked with an "MH103A" designator followed by an alphanumeric lot code on the top surface of the package.

The type and reference specifications for this part are located on the website in the "Application Notes" section.

### ESD / MSL Information



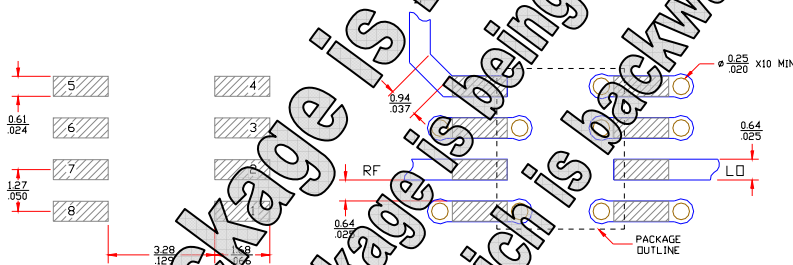
Caution! ESD sensitive device.

ESD Classification: Class 1B  
 Value: Passes  $\geq 500V$  to  $<1000V$   
 Test: Human Body Model (HBM)  
 Standard: JEDEC Standard JESD22-A114

ESD Classification: Class III  
 Value: Passes  $\geq 500V$  to  $<1000V$   
 Test: Charged Device Model (CDM)  
 Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 3 at  $+235^{\circ}C$  convection reflow  
 Standard: JEDEC Standard J-STD-020B

### Mounting Configuration / Land Pattern



1. Ground vias are required for thermal and RF grounding considerations. A minimum of 4 vias are required for 14 mil and 28 mil FR4 board.
2. If your PCB material is other than FR4, ground vias should be placed under the land pattern for better RF and thermal performance. Otherwise ground vias should be placed as close to land pattern as possible.
3. Trace width depends on PCB board.

### Functional Pin Layout

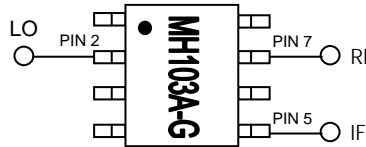
| Pin | Function |
|-----|----------|
| 1   | Ground   |
| 2   | LO Port  |
| 3   | Ground   |
| 4   | Ground   |
| 5   | IF Port  |
| 6   | Ground   |
| 7   | RF Port  |
| 8   | Ground   |

Specifications and information are subject to change without notice

## MH103A-G (Lead-Free Package) Mechanical Information

This package is lead-free/green/RoHS-compliant. The plating material on the leads is NiPdAu. It is compatible with both lead-free (maximum 260°C reflow temperature) and lead (maximum 245°C reflow temperature) soldering processes.

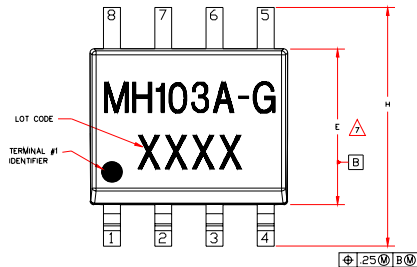
## Application Circuit (MH103A-PCB)



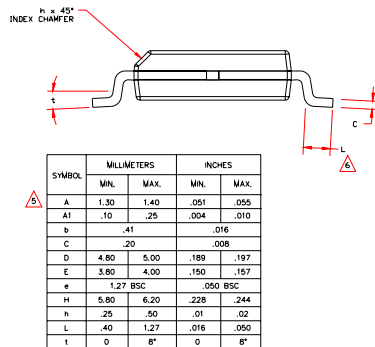
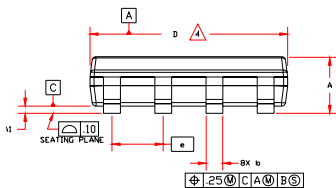
### Notes:

1. All other pins on mixer are grounded.
2. Circuit board material: .014" FR-4, 4 layers, .062" total thickness
3. Blocking capacitors are required on the ports (pins 2, 5, 7) if any dc signal is present.

## Outline Drawing



- NOTES:
1. EXCEPT WHERE NOTED, THIS PART OUTLINE CONFORMS TO JEDEC STANDARD MS-012, ISSUE C FOR SMALL OUTLINE (SMD) PERIPHERAL TERMINALS, 3.75mm BODY WIDTH (PLASTIC).
  2. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.4M-1994.
  3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
- ⚠ DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS, WHICH SHALL NOT EXCEED (.5mm(.006in)) PER SIDE.
  - ⚠ DEVIATION FROM JEDEC MS-012 STANDARD.
  - ⚠ LENGTH OF TERMINAL FOR SOLDERING TO A SUBSTRATE.
  - ⚠ DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS, WHICH SHALL NOT EXCEED (.5mm(.010in)) PER SIDE.



## Product Marking

The component will be marked with an "MH103A-G" designator followed by an alphanumeric lot code on the top surface of the package.

Tape and reel specifications for this part are located on the website in the "Application Notes" section.

## ESD / MSL Information



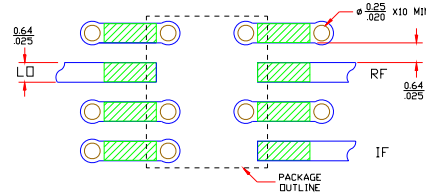
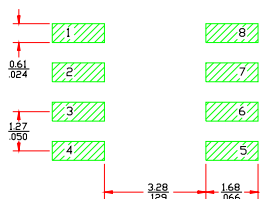
Caution! ESD sensitive device.

ESD Classification: Class 1B  
Value: Passes  $\geq 500V$  to  $<1000V$   
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

ESD Classification: Class III  
Value: Passes  $\geq 500V$  to  $<1000V$   
Test: Charged Device Model (CDM)  
Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 2 at +260 °C convection reflow  
Standard: JEDEC Standard J-STD-020B

## Land Pattern / Mounting Configuration



- Notes:
1. Ground vias are critical for RF grounding considerations.
  2. A minimum of 10 ground vias are required for 14 mil and 28 mil FR4 board.
  3. Trace width depends on PC board.

## Functional Pin Layout

| Pin | Function |
|-----|----------|
| 1   | Ground   |
| 2   | LO Port  |
| 3   | Ground   |
| 4   | Ground   |
| 5   | IF Port  |
| 6   | Ground   |
| 7   | RF Port  |
| 8   | Ground   |