



### Product Features

- +35 dBm IIP3
- RF: 1700 – 2000 MHz
- LO: 1450 – 1950 MHz
- IF: 50 – 250 MHz
- +17 dBm Drive Level
- Lead-free/Green SOIC8 package
- No External Bias Required

### Applications

- 2.5G and 3G GSM/CDMA/wCDMA
- Optimized for DCS/PCS-band Mobile Infrastructure

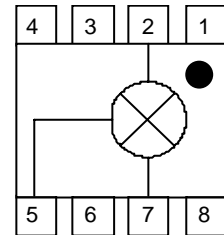
### Product Description

The MH1A 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 MH1A uses patented techniques to realize +35 dBm Input IP3 at an LO drive level of +17 dBm and can be used for upconverting or downconverting low-side LO applications.

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 2.5G and 3G GSM/CDMA /wCDMA systems in the DCS, PCS, or UMTS frequency bands.

### Functional Diagram



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

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

Parameters	Units	Min	Typ	Max	Comments
RF Frequency Range	MHz		1700 – 2000		
LO Frequency Range	MHz		1450 – 1950		
IF Frequency Range	MHz		50 – 250		
SSB Conversion Loss	dB		8.3	8.7	
Noise Figure	dB		8.5	9.2	See note 2
Input IP3	dBm	+30	+35		RF=1850-1910MHz, IF=235-245MHz, See note 3
Input IP3	dBm	+28	+35		All other RF/IF combinations, See note 3
Input P1dB	dBm		+20		
LO – RF Isolation	dB	25	30		LO = 1450 – 1950 MHz
LO – RF Isolation	dB		23		LO = 2256 – 2321 MHz
LO – IF Isolation	dB	27	38		
RF – IF Isolation	dB	12	20		
2LO – RF Isolation	dB		33		
Return Loss: RF Port	dB	10	14		Referenced to the nominal LO drive level of 17 dBm
Return Loss: IF Port	dB	10	20		Return loss phase is nominally at -90° at 1.9 GHz.
Return Loss: LO Port	dB	8	13		
LO Drive Level	dBm		+17		

1. Test conditions unless otherwise noted: RF / IF = 1700 / 250, 2000 / 50, and 2000 / 250 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  $R_{f_{in}} = 5$  dBm / tone.

### Absolute Maximum Rating

Parameter	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-65 to +100 °C
LO Power	+21 dBm
Input IF / RF Power	+20 dBm

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

### Ordering Information

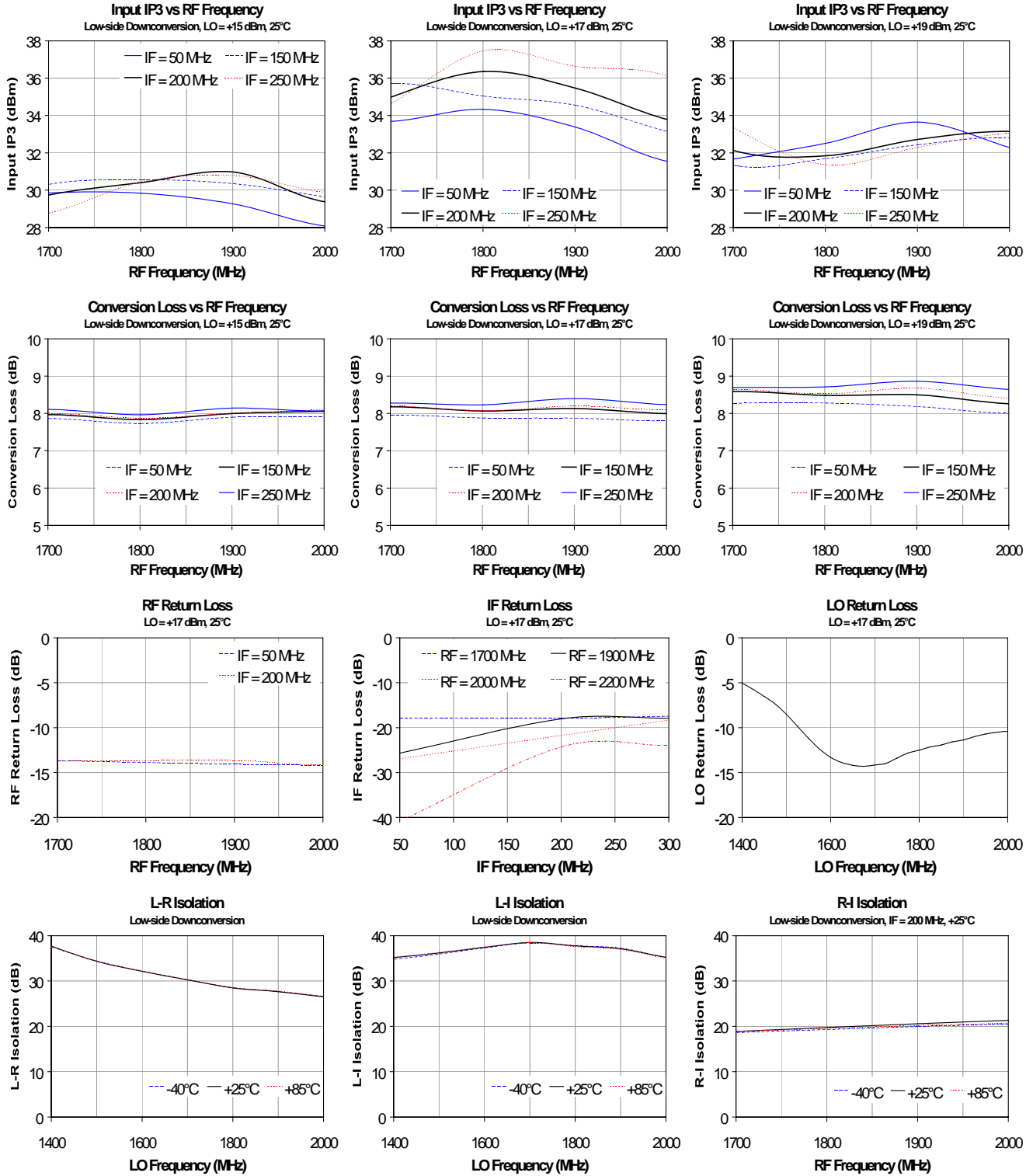
Part No.	Description
MH1A*	High Dynamic Range PCS-band MMIC Mixer (lead-tin SOIC-8 package)
MH1A-G	High Dynamic Range PCS-band MMIC Mixer (lead-free/green/RoHS-compliant SOIC-8 package)
MH1A-PCB	Fully-Assembled Mixer Application Board

\* 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



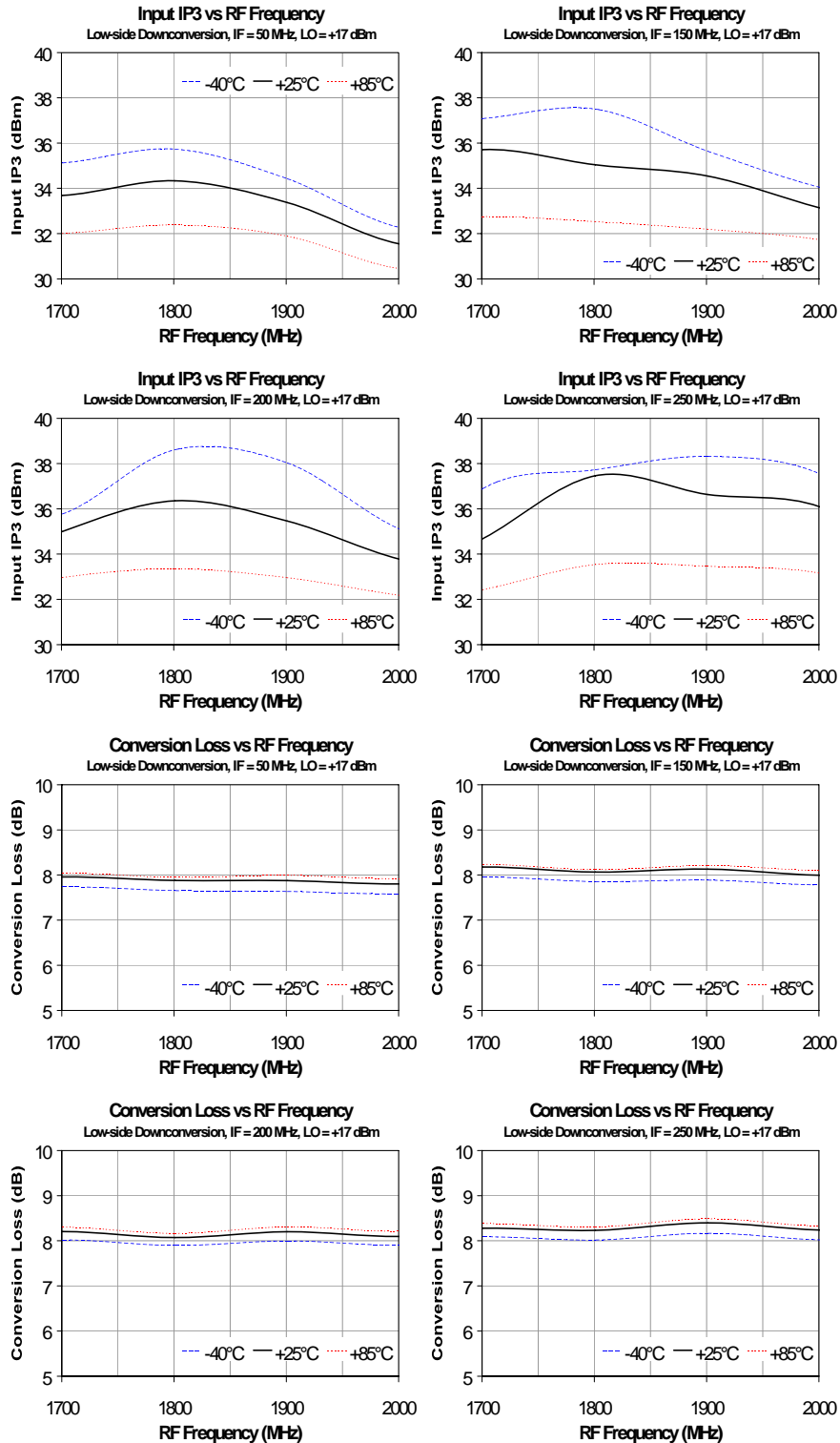
## Typical Performance Plots: Low-side Downconversion



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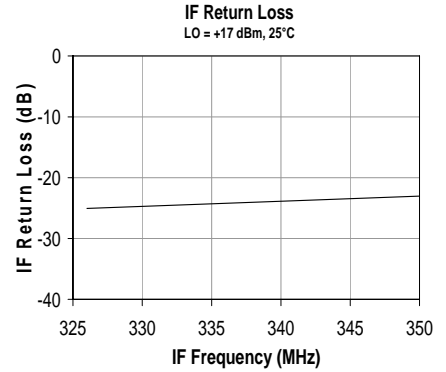
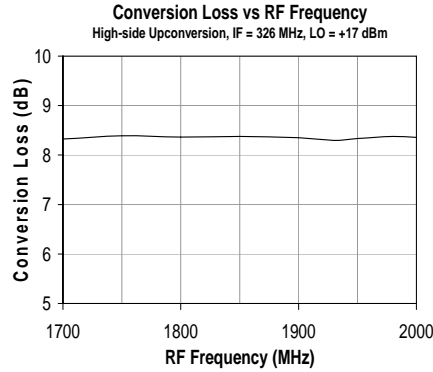
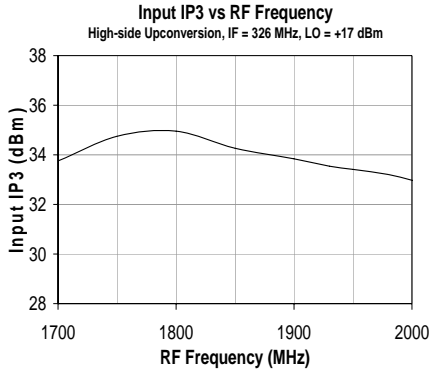
### Typical Performance Plots: Low-side Downconversion (cont'd)



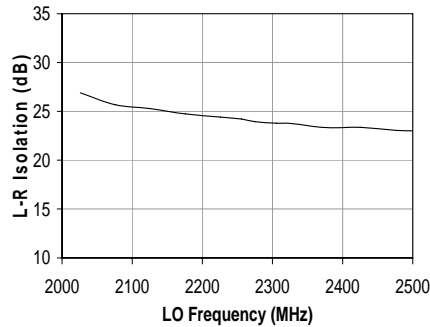
Specifications and information are subject to change without notice



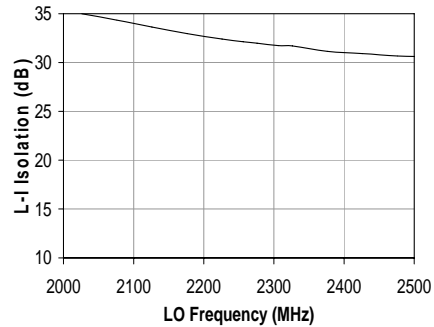
### Typical Performance Plots: High-side Upconversion



L-R Isolation



L-I Isolation

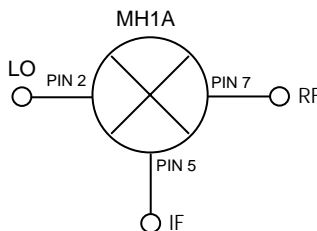




### MH1A (Tin-Lead SOIC-8 Package) Mechanical Information

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

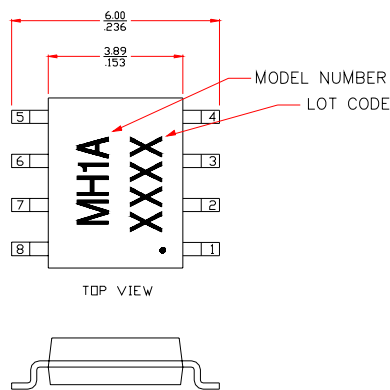
### Application Circuit (MH1A-PCB)



#### 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 ground signal is present.

### Outline Drawing



### Product Marking

The component will be marked with an "MH1A" 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



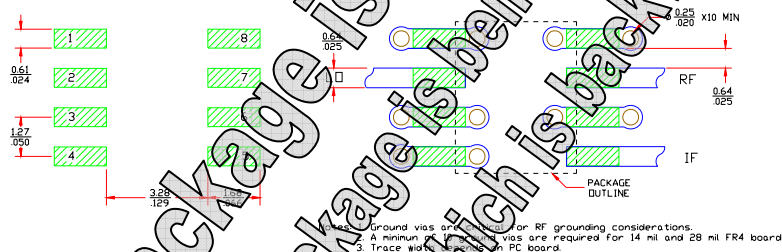
Caution! ESD sensitive device.

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

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

MSL Rating: Level 3 at +235 °C convection reflow  
 Standard: JEDEC Standard J-STD-020B

### Mounting Configuration / Land Pattern



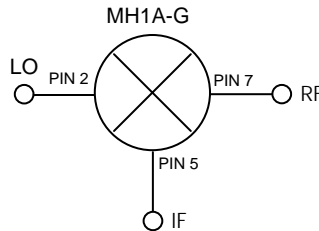
### Functional Pin Layout

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

## MH1A-G (Lead-Free/Green SOIC-8 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.

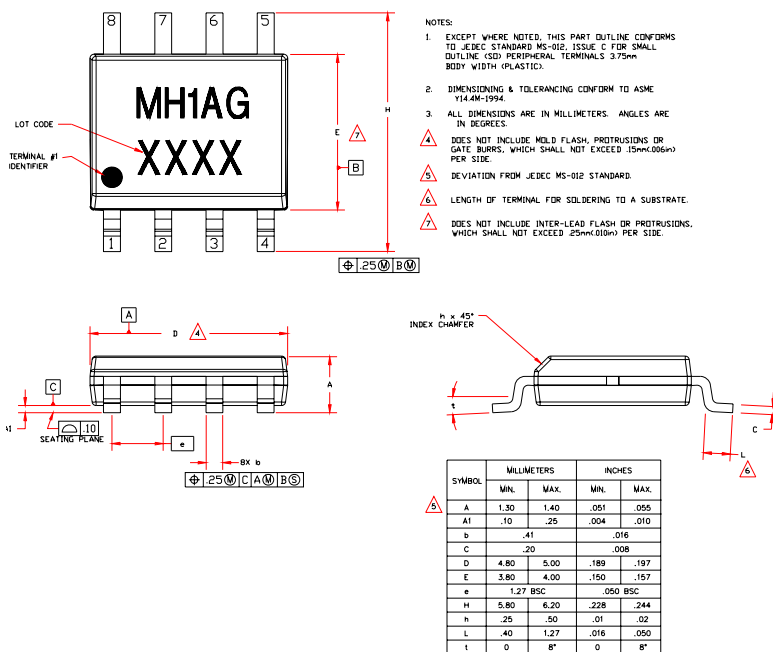
### Application Circuit (MH1A-PCB)



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 "MH1AG" 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



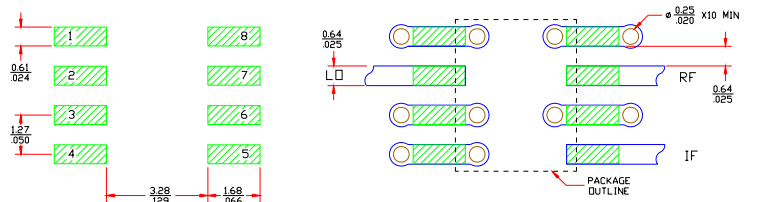
Caution! ESD sensitive device.

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

ESD Classification: Class III  
Value: Passes ≥ 500 V to <1000 V  
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