## Product Features

- +28 dBm IIP3
- RF $820-920 \mathrm{MHz}$
- IF $20-100 \mathrm{MHz}$
- ISO \& EPC compliant
- Low-side LO configuration
- +13 dBm LO Drive Level
- High L-I \& L-R Isolation (>38 dB)
- 6-pin 3x3 mm DFN lead-free/ green/RoHS-compliant Package
- No External Bias Required


## Applications

- RFID: UHF
- Readers
- Industrial
- Portable
- Handheld


## Product Description

The MH303 is a passive Quad-MOSFET mixer that provides high dynamic range performance in a low cost $3 \times 3 \mathrm{~mm} 6-\mathrm{pin}$ DFN (Dual Flat No-Lead) lead-free/green/RoHS-compliant package.

WJ's MH303 uses patented techniques to realize +28 dBm Input IP3 at an LO drive level of +13 dBm when used in a simple application circuit with a low-side LO configuration. The LO can also be driven with higher power levels up +20 dBm to achieve higher IP3 performance. This mixer integrates internal circuitry to provide single-ended interfaces for the RF \& LO ports.

Typical applications include frequency up/down conversion, modulation and demodulation for receivers and transmitters used in various current and next generation RFID technologies such as EPC, ISO, ETSI, and ANSI. Their small size makes them ideal for PCMCIA applications.

Functional Diagram


| Function | Pin No. |
| :---: | :---: |
| IF Differential Input | 1 |
| LO port | 3 |
| RF port | 4 |
| IF differential Input | 6 |
| Ground | 2,5 |

## Specifications

| Parameters | Units | Minimum | Typical | Maximum | Comments |  |
| :--- | :---: | :---: | :---: | :---: | :--- | :--- |
| RF Frequency Range | MHz | 820 |  | 920 |  |  |
| LO Frequency Range | MHz | 720 |  | 900 |  |  |
| IF Frequency Range | MHz | 20 | 70 | 100 | See note 2 |  |
| SSB Conversion Loss | dB |  | 7.5 | 8.0 | See note 3 |  |
| Input IP3 | dBm | +26 | +27 |  | $\mathrm{RF}=820 \mathrm{MHz}$, See note 4 |  |
| Input IP3 | dBm | +27 | +28 |  | $\mathrm{RF}=870 \mathrm{MHz}$, See note 4 |  |
| Input IP3 | dBm | +26 | +27 |  | $\mathrm{RF}=920 \mathrm{MHz}$, See note 4 |  |
| Input 1 dB Compression Point | dBm |  | +17.5 |  | See note 5 |  |
| Noise Figure | dB |  | 8 |  |  |  |
| LO Input Drive Level | dBm |  | +13 |  |  |  |
| LO-RF Isolation | dB | 35 | 38 |  | LO freq $=750-850 \mathrm{MHz}$ |  |
| LO-IF Isolation | dB | 40 | 44 |  |  |  |
| Return Loss: RF Port | dB |  | 18 |  |  |  |
| Return Loss: LO Port |  | dB |  | 12 |  |  |
| Return Loss: IF Port |  | dB |  | 10 |  |  |

1. Data was taken using an application board in a $50 \Omega$ system, with a low side LO at +13 dBm in a downconverting application at $25^{\circ} \mathrm{C}$ with an IF frequency $=70 \mathrm{MHz}$.
2. An IF frequency of 70 MHz is a nominal frequency. The IF frequency can be specified by the user within the constraints of the specified minimum and maximum RF and LO frequency range.
3. The conversion loss includes the loss of an IF transformer (M/A COM ETC1-1-13, nominal loss 0.7 dB at 70 MHz )
4. Input IP3 is measured with two tones with an input power of $+3 \mathrm{dBm} /$ tone separated by 1 MHz .
5. Although the input P 1 dB level is much higher, the continuous RF input power should not exceed +12 dBm . Operation above +12 dBm may cause permanent damage.

## Absolute Maximum Ratings

| Parameters | Rating |
| :--- | :--- |
| Operating Case Temperature | $-40^{\circ}$ to $+85^{\circ} \mathrm{C}$ |
| Storage Temperature | $-40^{\circ}$ to $+125^{\circ} \mathrm{C}$ |
| LO Input Power | +20 dBm |
| RF Input Power | +12 dBm |

## Ordering Information

| Part No. | Description |
| :--- | :--- |
| MH303 | Cellular-band Quad-FET Mixer <br> (lead-tin plated pins) |
| MH303-G | Cellular-band Quad-FET Mixer <br> (lead-fre/green/RoHS-compliant Package) |
| MH303-PCB | Fully-Assembled MH303 Application Board |

[^0]Typical Performance Charts


Application Circuit


M/A-Com E-Series, ETC1-1-13
RF 1:1 Transformer. $4.5-3000 \mathrm{MHz}$

## MH303 Mechanical Information

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

## Package Information


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## Product Marking

The component will be laser marked with a model number "M303" designator exactly as shown followed by an assembly date code in location shown by "YYWW". A laser marked lot code will be in the location shown by "XXX" and is unique for every assembly lot.

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


Functional Schematic Diagram


## ESD / MSL Information

ESD Rating:
Value:
Test:
Standard:
MSL Rating:
Standard:

Class 1B
Passes at 500 V
Human Body Model (HBM)
JEDEC Standard JESD22-A114
Level 1 at $235^{\circ} \mathrm{C}$ convection reflow JEDEC Standard J-STD-020

## MH303-G Mechanical Information

This package is lead-free/Green/RoHS-compliant. It is compatible with both lead-free (maximum $260^{\circ} \mathrm{C}$ reflow temperature) and leaded (maximum $245^{\circ} \mathrm{C}$ reflow temperature) soldering processes. The plating material on the leads is annealed matte tin over copper.


## notes

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## Product Marking

The component will be laser marked with a model number "G303" designator exactly as shown followed by an assembly date code in location shown by "YYWW". A laser marked lot code will be in the location shown by "XXX" and is unique for every assembly lot.

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


Functional Schematic Diagram


ESD / MSL Information
ESD Rating:
Test: $\quad$ Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114
MSL Rating: Level 1 at $260^{\circ} \mathrm{C}$ convection reflow
Standard: JEDEC Standard J-STD-020


[^0]:    Operation of this device above any of these parameters may cause permanent damage.

