## Features

- 2-Stage LNA and High Power Switch
- High RF Input Power:

120 W CW @ $+85^{\circ} \mathrm{C}, 2.0 \mathrm{GHz}$
100 W CW @ $+85^{\circ} \mathrm{C}, 2.7 \mathrm{GHz}$

- Noise Figure:
$0.85 \mathrm{~dB} @ 2.0 \mathrm{GHz}$
1.0 dB @ 2.7 GHz
- Gain:
$37 \mathrm{~dB} @ 2.0 \mathrm{GHz}$
$34 \mathrm{~dB} @ 2.7 \mathrm{GHz}$
- OIP3: 36 dBm
- Lead-Free 5 mm 32-lead HQFN
- Integrated ESD Protection
- Halogen-Free "Green" Mold Compound
- ROHS* Compliant


## Description

The MAIA-011004 is a compact surface mount module containing a PIN diode switch and two low noise amplifiers assembled in a 5 mm 32-lead HQFN plastic package. It was designed to be used at the input of the receive chain of TDD cellular base stations.
This module operates from 0.4 GHz to 5.0 GHz and features high power handling, very low noise figure and excellent linearity.
The connection between the output of LNA1 and the input of LNA2 is made outside of the module, making it possible for the user to add an attenuator or a filter.
The MAIA-011004 is ideally suited for 4G and next generation 5 G base stations at $1.9,2.3,2.6,3.5$, and 4.5 GHz.

Ordering Information ${ }^{1,2}$

| Part Number | Package |
| :---: | :---: |
| MAIA-011004-TR1000 | 1k Piece Reel |
| MAIA-011004-TR3000 | 3k Piece Reel |
| MAIA-011004-1SMB | $2-3 \mathrm{GHz}$ Sample Board |
| MAIA-011004-2SMB | $3-4 \mathrm{GHz}$ Sample Board |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

## Functional Schematic



## Pin Configuration

| Pin \# | Pin Name | Function |
| :---: | :---: | :---: |
| $\begin{gathered} 1-4,6-10,12 \\ 16,18,23,25,32 \end{gathered}$ | N/C ${ }^{3}$ | No Connection |
| 5 | $\mathrm{RF}_{\text {IN }}$ | RF Input / Bias |
| 11 | $\mathrm{R}_{\mathrm{X}}$ | $\mathrm{R}_{\mathrm{x}}$ Switch Output |
| $\begin{gathered} 13,14,20,21, \\ 27,29,30 \end{gathered}$ | GND | RF Ground |
| 15 | LNA1 ${ }_{\text {IN }}$ | LNA1 Input |
| 17 | $V_{B} 1$ | LNA1 Bias |
| 19 | LNA1 out | LNA1 Output / V ${ }_{\text {DD }} 1$ |
| 22 | LNA2 ${ }_{\text {IN }}$ | LNA2 Input |
| 24 | RFout | RF Output / V $\mathrm{VD}^{2}$ |
| 26 | $\mathrm{V}_{\mathrm{B}} 2$ | LNA2 Bias |
| 28 | $\mathrm{V}_{\mathrm{C}}$ | Switch Bias Control |
| 31 | Load | $\mathrm{T}_{\mathrm{x}}$ Switch Output |
| 33 | Paddle | Ground ${ }^{4}$ |

3. MACOM recommends connecting unused package pins (N/C) to ground.
4. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.
[^0]
## Electrical Specifications ${ }^{5}$ :

$\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}, \mathrm{V}_{\mathrm{DD}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{DD}} 2=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 2=3 \mathrm{~V}$
Switch Bias = (see Bias Table), $\mathrm{R}_{\text {BIAS }} 2=133 \Omega, \mathrm{R}_{\text {BIAS }} 1=100 \Omega, \mathrm{Z}_{0}=50 \Omega$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Input RF Power @ $+85^{\circ} \mathrm{C}$ RFin - LOAD | $\begin{aligned} & 2.0 \mathrm{GHz} \\ & 2.7 \mathrm{GHz} \\ & 3.5 \mathrm{GHz} \end{aligned}$ | W | - | $\begin{gathered} 120 \\ 100 \\ 80 \end{gathered}$ | - |
| Insertion Loss $R F_{\text {IN }}$ - LOAD | $\begin{aligned} & 2.0 \mathrm{GHz} \\ & 2.7 \mathrm{GHz} \\ & 3.5 \mathrm{GHz} \end{aligned}$ | dB | - | $\begin{aligned} & 0.15 \\ & 0.18 \\ & 0.21 \end{aligned}$ | - |
| Noise Figure RF IN - RF $_{\text {out }}$ | $\begin{aligned} & 2.0 \mathrm{GHz} \\ & 2.7 \mathrm{GHz} \\ & 3.5 \mathrm{GHz} \end{aligned}$ | dB | - | $\begin{aligned} & 0.85 \\ & 1.00 \\ & 1.25 \end{aligned}$ | - |
| Gain <br> RF $_{\text {IN }}$ - RFout | $\begin{aligned} & 2.0 \mathrm{GHz} \\ & 2.7 \mathrm{GHz} \\ & 3.5 \mathrm{GHz} \end{aligned}$ | dB | - | 37 34 32 | - |
| Isolation $R F_{\text {IN }}-L N A 1_{\text {IN }}$ | $\begin{gathered} \text { Switch State }=\mathrm{RF}_{\mathrm{IN}}-\mathrm{LOAD} \\ 2.7 \mathrm{GHz} \end{gathered}$ | dB | - | 41 | - |
| Isolation <br> LNA1 ${ }_{\text {out }}$ - LNA $2_{\text {IN }}$ | $\begin{gathered} \text { Switch State }=\mathrm{RF}_{\mathrm{IN}}-\mathrm{RF}_{\text {out }} \\ 2.7 \mathrm{GHz} \end{gathered}$ | dB | - | 40 | - |
| Output IP3 <br> RF $_{\text {IN }}$ - RF ${ }_{\text {OUT }}$ | $\begin{gathered} P_{\text {IN }}=-35 \mathrm{dBm} \text {, Tones } 11 \mathrm{MHz} \text { apart } \\ 2.7 \mathrm{GHz} \end{gathered}$ | dBm | - | 36 | - |
| LNA Bias Current | LNA1 Current: $\mathrm{I}_{\mathrm{DD}} 1+\mathrm{I} \mathrm{V}_{\mathrm{B}} 1$ <br> LNA2 Current: $I_{D D} 2+V_{B} 2$ | mA | - | $\begin{aligned} & 75 \\ & 65 \end{aligned}$ | - |

5. Refer to LNA biasing options on page 4.

## Switch Bias Table (See Sample Board Schematic on Page 9)

| RF ${ }_{\text {IN }}$ - LOAD | RF ${ }_{\text {IN }}-\mathrm{RF}_{\text {OUt }}$ | LOAD_B | RxBias | Rx_ShD_B | $\mathbf{V}_{-} \mathrm{RF}_{\text {IN }}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| ON | OFF | $0 \mathrm{~V}(-50 \mathrm{~mA})$ | +28V(50 mA) | $0 \mathrm{~V}(-50 \mathrm{~mA})$ | $3 \mathrm{~V}(50 \mathrm{~mA})$ |
| OFF | ON | $+28 \mathrm{~V}(0 \mathrm{~mA})$ | $0 \vee(-50 \mathrm{~mA})$ | +28 V (0mA) | $3 \mathrm{~V}(50 \mathrm{~mA})$ |

## Absolute Maximum Ratings ${ }^{6,7,8}$

| Parameter | Absolute Maximum |
| :---: | :---: |
| $\begin{gathered} \text { RF Input Power } \\ \text { RF IN } \text { RF } \\ \text { RF IN }- \text { LOAD } \end{gathered}$ | $19 \text { dBm }$ <br> See Power De-rating Curve |
| Switch Reverse Voltage (RF \& DC) | 160 V |
| $\mathrm{V}_{\mathrm{B}} 1$ \& $\mathrm{V}_{\mathrm{B}} 2$ | 5.0 V |
| LNA1 ${ }_{\text {OUT }}$ \& RF ${ }_{\text {OUT }}$ | 5.5 V |
| Junction Temperature Switch LNA ${ }^{9}$ | $\begin{aligned} & +175^{\circ} \mathrm{C} \\ & +150^{\circ} \mathrm{C} \end{aligned}$ |
| Operating Temperature | $-40^{\circ} \mathrm{C}$ to $+100^{\circ} \mathrm{C}$ |
| Storage Temperature | $-55^{\circ} \mathrm{C}$ to $+150^{\circ} \mathrm{C}$ |

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. MACOM does not recommend sustained operation near these survivability limits.
8. Operating at nominal conditions with $\mathrm{T}_{J} \leq$ Absolute Maximum will ensure MTTF $>1 \times 10^{6}$ hours.
9. LNA Junction Temperature $\left(\mathrm{T}_{\mathrm{J}}\right)=\mathrm{T}_{\mathrm{C}}+\Theta_{\mathrm{Jc}}{ }^{*}\left(\mathrm{~V}^{*} \mathrm{I}\right)$

Typical thermal resistance $\left(\Theta_{\mathrm{Jc}}\right)=83^{\circ} \mathrm{C} / \mathrm{W}$
a) For $\mathrm{T}_{\mathrm{C}}=+25^{\circ} \mathrm{C}$,
$\mathrm{T}_{\mathrm{J}}=56^{\circ} \mathrm{C} @ \mathrm{~V}_{\mathrm{DD}} 1=5 \mathrm{~V}, 75 \mathrm{~mA}$ for LNA1
$\mathrm{T}_{\mathrm{J}}=52^{\circ} \mathrm{C} @ \mathrm{~V}_{\mathrm{DD}} 2=5 \mathrm{~V}, 65 \mathrm{~mA}$ for LNA2
b) For $\mathrm{T}_{\mathrm{C}}=+100^{\circ} \mathrm{C}$,
$\mathrm{T}_{\mathrm{J}}=131^{\circ} \mathrm{C} @ \mathrm{~V}_{\mathrm{DD}} 1=5 \mathrm{~V}, 75 \mathrm{~mA}$ for LNA1
$\mathrm{T}_{\mathrm{J}}=127^{\circ} \mathrm{C} @ \mathrm{~V}_{\mathrm{DD}} 1=5 \mathrm{~V}, 65 \mathrm{~mA}$ for LNA2
$T_{X}$ Input Power De-rating @ 20 dB I/O Return Loss


## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

| Parameter | Rating | Standard |
| :---: | :---: | :---: |
| Human Body Model <br> (HBM) | $500 ~ V$ <br> (Class 1B) | ESDA / JEDEC <br> JS-001 |
| Charged Device <br> Model (CDM) | $1000 ~ V$ <br> (Class C3) | JEDEC <br> JESD22-C101 |

## LNA Biasing Options

LNA1 and LNA2 biases can be set in 2 different ways: using only $V_{D D}$, or using separate $V_{D D}$ and $V_{B I A S}$ [ $V_{B}$ ] voltages. A separate $\mathrm{V}_{\text {BIAs }}$ voltage allows $\mathrm{V}_{\mathrm{B}} 1$ and $\mathrm{V}_{\mathrm{B}} 2$ to be used as enable pins to power LNA1 and LNA2 up and down during operation.

For both bias methods, select the value of $R_{\text {BIAS }} 1$ and $R_{\text {BIAS }} 2$ to achieve the desired currents using the plots on page 5. LNA1 current should not exceed $100 \mathrm{~mA} @ 25^{\circ} \mathrm{C}$ and likewise LNA2 current should not exceed 95 mA $@ 25^{\circ} \mathrm{C}$. DC blocking capacitors must be used at the LNA1 and 2 input and output ports (see diagram).

## Biasing Option - $\mathrm{V}_{\mathrm{DD}}$ only

To use only $V_{D D}$, connect to $V_{D D}[1,2]$ through an $R F$ inductor and connect $V_{B}[1,2]$ to the corresponding $V_{D D}$ through bias resistor $\mathrm{R}_{\text {BIAS }}[1,2]$ as shown in Figure 1.


Figure 1

## Biasing Option - Separate $\mathrm{V}_{\mathrm{DD}}$ and $\mathrm{V}_{\mathrm{BB}}$ Voltages ( $\mathrm{V}_{\mathrm{BB}} \leq \mathrm{V}_{\mathrm{DD}}$ )

To use separate $\mathrm{V}_{D D}$ and $\mathrm{V}_{B B}$ voltages, connect to $\mathrm{V}_{D D}[1,2]$ through an $R F$ inductor and connect to $\mathrm{V}_{B B}[1,2]$ through bias resistor $R_{B I A S}[1,2]$ as shown in Figure 2. Typical current draw for $\mathrm{V}_{\mathrm{B}}[1,2]$ is $1.4 \mathrm{~mA} @ \mathrm{~V}_{\mathrm{BB}}=3 \mathrm{~V}$,and $1 \mu \mathrm{~A} @ \mathrm{~V}_{\mathrm{BB}}=0 \mathrm{~V}$. Typical current draw for $\mathrm{V}_{\mathrm{DD}}[1,2]$ is $<1 \mu \mathrm{~A} @ \mathrm{~V}_{\mathrm{BB}}=0 \mathrm{~V}$ and $\mathrm{V}_{\mathrm{DD}}=3 \mathrm{~V}$.


Figure 2

## Typical Performance Curves: LNA1 Bias Current over Temperature

LNA1 Current, $V_{D D} 1=3$ V


LNA1 Current, $V_{D D} 1=5 \mathrm{~V}$


## Typical Performance Curves: LNA2 Bias Current over Temperature

LNA2 Current, $V_{D D} 2=3$ V


LNA2 Current, $V_{D D} 2=5 \mathrm{~V}$


Typical Performance Curves: $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}, \mathrm{Z}_{0}=50 \Omega, \mathrm{~V}_{\mathrm{DD}}=3 \mathrm{~V}$, Switch State $=\mathrm{RF}_{\mathrm{IN}}-$ RF $_{\text {OUT }}$

Gain vs. LNA1-2 Voltage


Input Return Loss vs. LNA1-2 Voltage


OIP3 vs. LNA1-2 Voltage


Noise Figure over Temperature, $V_{D D}=3$ V


Output Return Loss vs. LNA1-2 Voltage


OIP3 over Temperature, $V_{D D}=3 V$


## Typical Performance Curves: $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}, \mathrm{Z}_{0}=50 \Omega, \mathrm{~V}_{\mathrm{DD}}=3 \mathrm{~V}, \mathrm{RF}_{\mathrm{IN}}-\operatorname{LOAD}$



S11 vs. Switch Bias Current


P1dB vs. LNA1-2 Voltage, State $=R F_{I N}-R F_{o u t}$


Isolation, $R F_{I N}$ to LNA1 ${ }_{I N}$ vs. Bias Current


## S22 vs. Switch Bias Current


$P 1 d B$ vs. Temperature, State $=R F_{I N}-$ RFout


Electrical Specifications: $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}, \mathrm{V}_{\mathrm{DD}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{DD}} 2=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 2=3 \mathrm{~V}$, Switch Bias = (see Bias Table), R5 = 133 $\Omega^{10}, R 7=100 \Omega^{10}$; Tuned for 2-3 GHz band

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Gain | $R F_{I N}-R F_{\text {OUT }}, 2.7 \mathrm{GHz}$ | dB | 31 | 34 | - |
| Noise Figure | $\mathrm{RF}_{\mathrm{IN}}-\mathrm{RF}_{\mathrm{OUT}}, 2.7 \mathrm{GHz}$ | dB | - | 1.1 | 1.5 |
| Input Return Loss | $\mathrm{RF}_{\mathrm{IN}}-\mathrm{RF}_{\mathrm{OUT}}, 2.7 \mathrm{GHz}$ | dB | - | 11 | - |
| Output Return Loss | $\mathrm{RF}_{\mathrm{IN}}-\mathrm{RF}_{\mathrm{OUT}}, 2.7 \mathrm{GHz}$ | dB | - | 18 | - |
| LNA Bias Current | LNA1 Current: $\mathrm{I}_{\mathrm{DD}} 1+\mathrm{IV}_{\mathrm{B}} 1$ | mA | - | 75 | - |

10. Refer to LNA Sample Board Schematic on page 9.

## Typical Performance Curves: 2-3 GHz tuned Sample Board, RF ${ }_{\text {IN }}$ - RFout

Gain


Input Return Loss


Noise Figure


Output Return Loss


## Schematic: MAIA-011004 Sample Board





## PCB Layout: MAIA-011004 Sample Board



Sample Board Parts List* for 2-3 GHz Tuned PCB

| Part | Value | Description | MFR Part \# |
| :---: | :---: | :---: | :---: |
| C1, C2, C5, | $27 \mathrm{pF} / 250 \mathrm{~V}$ | 0603 SMT Capacitor | ATC600S270GT250T |
| C3 | $22 \mathrm{pF} / 250 \mathrm{~V}$ | 0402 SMT Capacitor | ATC600L220FT200T |
| C4 | $3.3 \mathrm{pF} / 50 \mathrm{~V}$ | 0402 SMT Capacitor | GRM1555C1H3R3BA01D |
| $\begin{gathered} \text { C6, C7,C8, C9, } \\ \text { C10, C13, C14, C15 } \end{gathered}$ | $4.7 \mu \mathrm{~F} / 35 \mathrm{~V}$ | 0603 SMT Capacitor | - |
| C11 | $10 \mathrm{nF} / 25 \mathrm{~V}$ | 0402 SMT Capacitor | - |
| C12 | $1 \mathrm{nF} / 25 \mathrm{~V}$ | 0402 SMT Capacitor | - |
| C21 | $0.40 \mathrm{pF} \pm 0.1 \mathrm{pF}$ | 0402 SMT Capacitor | GJM1555C1HR40BB01 |
| L1, L2, L3, L5 ,L6, L9 | $68 \mathrm{nH} / 100 \mathrm{~mA}$ | 0402 SMT Inductor | 0402CS-68NXJLW |
| L4 | 2.7 nH | 0402 SMT Inductor | 0402CS-2N7XJLU |
| L8 | 2.0 nH | 0402 SMT Inductor | 0402CS-2N0XJLU |
| R1 | $45 \Omega / 1.0 \mathrm{~W}$ | 2512 SMT Resistor | - |
| R3, R4 | $270 \Omega / 1.0 \mathrm{~W}$ | 2512 SMT Resistor | - |
| R5 ( $\mathrm{R}_{\text {BIAs }} 2$ ) | $133 \Omega$ | 0805 SMT Resistor | - |
| R7 ( $\mathrm{R}_{\text {BIAS }} 1$ ) | $100 \Omega$ | 0402 SMT Resistor | - |
| J1-J3 | SMA END LAUNCH | RF CONNECTOR | 142-0761-821 |
| R2, C16, C18, C19, C20, C22 | do not populate |  |  |
| * Aluminum heat sink mounted to backside of PCB is not shown |  |  |  |

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

Electrical Specifications: $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}, \mathrm{V}_{\mathrm{DD}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 1=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{DD}} 2=3 \mathrm{~V}, \mathrm{~V}_{\mathrm{BB}} 2=3 \mathrm{~V}$, Switch Bias = (see Bias Table), R5 = 133 $\Omega^{10}, R 7=100 \Omega^{10}$; Tuned for 3-4 GHz band

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Gain | $\mathrm{RF}_{\text {IN }}-\mathrm{RF}_{\text {out }}, 3.5 \mathrm{GHz}$ | dB | - | 32 | - |
| Noise Figure | $\mathrm{RF}_{\text {IN }}-\mathrm{RF}_{\text {out }}, 3.5 \mathrm{GHz}$ | dB | - | 1.3 | - |
| Input Return Loss | $\mathrm{RF}_{\text {IN }}-\mathrm{RF}_{\text {OUT }}$, 3.5 GHz | dB | - | 12 | - |
| Output Return Loss | $\mathrm{RF}_{\text {IN }}-\mathrm{RF}_{\text {out }}, 3.5 \mathrm{GHz}$ | dB | - | 14 | - |
| LNA Bias Current | LNA1 Current: $\mathrm{I}_{\mathrm{DD}} 1+\mathrm{I} \mathrm{V}_{\mathrm{B}} 1$ <br> LNA2 Current: $I_{D D} 2+V_{B} 2$ | mA | - | $\begin{aligned} & 75 \\ & 65 \end{aligned}$ | - |

## Typical Performance Curves: 3-4 GHz tuned Sample Board, RF IN $_{\text {- RFout }}$



Input Return Loss


Noise Figure


Output Return Loss


## Sample Board Parts List* for 3-4 GHz Tuned PCB

| Part | Value | Description | MFR Part \# |
| :---: | :---: | :---: | :---: |
| C1, C2, C5 | $27 \mathrm{pF} / 250 \mathrm{~V}$ | 0603 SMT Capacitor | ATC600S270GT250T |
| C3 | $22 \mathrm{pF} / 250 \mathrm{~V}$ | 0402 SMT Capacitor | ATC600L220FT200T |
| C4, C12 | $1000 \mathrm{pF} / 25 \mathrm{~V}$ | 0402 SMT Capacitor | - |
| $\begin{gathered} \text { C6, C7,C8, C9, } \\ \text { C10, C13, C14, C15 } \end{gathered}$ | $4.7 \mu \mathrm{~F} / 35 \mathrm{~V}$ | 0603 SMT Capacitor | - |
| C11 | $10 \mathrm{nF} / 25 \mathrm{~V}$ | 0402 SMT Capacitor | - |
| C21 | $0.50 \mathrm{pF} \pm 0.1 \mathrm{pF}$ | 0402 SMT Capacitor | GJM1555C1HR50BB01 |
| L1, L2, L3, L5 ,L6, L9 | $68 \mathrm{nH} / 100 \mathrm{~mA}$ | 0402 SMT Inductor | 0402CS-68NXJLW |
| L4 | 1.2 nH | 0402 SMT Inductor | 0402CS-1N2XJLU |
| L8 | 2.0 nH | 0402 SMT Inductor | 0402CS-2N0XJLU |
| R1 | $45 \Omega / 1.0 \mathrm{~W}$ | 2512 SMT Resistor | - |
| R3, R4 | $270 \Omega / 1.0 \mathrm{~W}$ | 2512 SMT Resistor | - |
| R5 ( $\mathrm{R}_{\text {BIAS }} 2$ ) | $133 \Omega$ | 0805 SMT Resistor | - |
| R7 ( $\mathrm{R}_{\text {BIAs }} 1$ ) | $100 \Omega$ | 0402 SMT Resistor | - |
| J1-J3 | SMA END LAUNCH | RF CONNECTOR | 142-0761-821 |
| R2, C16, C18, C19, C20, C22 | do not populate |  |  |
| * Aluminum heat sink mounted to backside of PCB is not shown |  |  |  |

## Lead-Free 5 mm 32-Lead HQFN ${ }^{\dagger}$


$\dagger$ Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is NiPdAuAg.

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.
These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.


[^0]:    * Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

