Down Converter 1500 — 2400 MHz

Features

- LNA Mixer integration
- Typical conversion gain of 7 dB
- Typical Two-Tone IM Ratio of ≥ 50 dBm
- LO Drive-Level: +13 dBm
- Low Cost / High Performance
- 50 ohm Nominal Impedance
- Lead-Free QSOP-16 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of SA65-0003

Description

M/A-COM's MAIA-007495-000100 is an integrated assembly containing a GaAs FET MMIC LNA and GaAs FET mixer. This device is packaged in a 16 leaded QSOP plastic surface mount package. The amplifier can be biased with either +3V or +5V, the mixer requires no DC bias. The conversion gain of the integrated combination is typically 6 dB at +3V bias and 8 dB at +5V bias. The SA65-0003 is ideally suited for RF/IF communications applications requiring down conversion with some gain.

This MCM contains a mixer that is fabricated using a mature 1-micron GaAs process, it also contains an LNA that is fabricated using a low cost mature 0.5-micron gate length GaAs MESFET process. Both die feature full passivation for increased performance and reliability.

Ordering Information

1

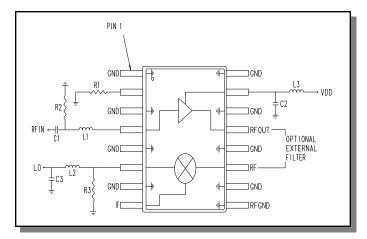
Part Number	Package
MAIA-007495-000100	Bulk Packaging
MAIA-007495-0001TR	1000 piece reel
MAIA-007495-0001TB	Sample Test Board

Note: Reference Application Note M513 for reel size information. Note: Die quantity varies.

typical. Mechanical outline has been fixed. Engineering samples

Commitment to produce in volume is not g

Functional Block Diagram



1. See "External Circuiting Parts" on Sheet 3 for the values of the external components.

Pin Configuration

Pin #	Function Description	
1	GND	RF and DC Ground
2	RES	External current control (optional)
3	GND	RF and DC Ground
4	RF IN	RF Input of the amplifier
5	GND	RF and DC Ground
6	LO	LO port of the mixer
7	GND	RF and DC Ground
8	IF	IF port of the mixer
9	RF GND	RF and DC Ground
10	GND	RF and DC Ground
11	RF ²	RF port of the mixer
12	GND	RF and DC Ground
13	RF OUT ²	RF output of the amplifier
14	GND	RF and DC Ground
15	V _{DD}	Positive supply voltage
16	GND	RF and DC Ground

2. The output port of the amplifier, RFOUT, and the input port of the mixer, RF, are adjacently placed so that an external filter can be used.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

a may by available.

cn

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are

- North America Tel: 800.366.2266
 Europe Tel: +353.21.244.6400
 India Tel: +91.80.4155721
 China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

ained herein without notice.

M/A-COM Technology Solutions incranduts affiliates reserve the right to make

ormation o



Rev. V1

Down Converter 1500 — 2400 MHz

Electrical Specifications: $T_A = +25^{\circ}C$, $Z_0=50$ Ohms, RF = -10 dBm³,

$LO = +13 \text{ dBm}, I_{DD} \approx 45 \text{ mA}$

Parameter	Test Conditions ³	Units	Min	Тур	Max
Conversion Gain ^{8,9}	LNA +3V LNA +5V	dB dB	3.1 4.6	6.0 8.0	6.6 8.8
Isolation ⁶	LO to RF IN LO to IF	dB dB	29 19	32 23	_
Reverse Isolation ⁷	LNA +3V	dB	30	40	—
VSWR	LO RF IN IF	Ratio Ratio Ratio		1.4:1 1.9:1 1.9:1	 2.5:1 2.1:1
Input IP3 ^{3,4,5}	LNA +3V LNA +5V	dBm dBm	13 21	17.5 25	_

3. For IP₃ measurements, RFIN = -24 dBm, this low RF IN level gets amplified through the LNA.

4. For IP₃ measurements, RFIN2 = RFIN1 + 10 MHz, LO = RFIN1—140 MHz.

5. For IP₃ measurements, IP3 = IMR/2 + PIN.

6. RF IN to IF Isolation is typically 0 dB.

7. Reverse Isolation is measured from IF to RFIN with the IF at -10 dBm, LO at +13 dBm.

8. The amplifier has a normal gain of 12.5 dB, 3V bias and 14.0 dB, 5V bias. Amplifier typical Noise Figure = 1.5 dB.

9. $NF_T = NF_1 + (NF2 - 1)/G1$

Parameter	Absolute Maximum
RF Input Power ¹²	+17 dBm
LO Drive Power ¹²	+23 dBm
V _{DD}	+10 VDC
Current ¹³	80 mA
Channel Temperature ¹⁴	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

Absolute Maximum Ratings ^{10,11}

10.Exceeding any one or combination of these limits may cause permanent damage to this device.

11.M/A-COM does not recommend sustained operation near these survivability limits.

12.Total power for RF and LO ports should not exceed +23 dBm.

13.When pin #2 is used to increase current—see note 8 above.

14.Thermal resistance (θ jc) = +95°C/W.

2

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

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

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology

- North America Tel: 800.366.2266
 Europe Tel: +353.21.244.6400
 India Tel: +91.80.4155721
 China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples indo net to a may be available commitment to produce in volume is not guaranteed.

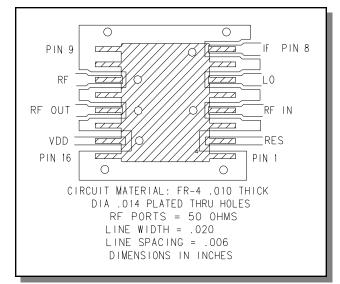


Down Converter 1500 — 2400 MHz



Rev. V1

Recommended PCB Configuration



Spurious Table

	4X	-12	-37	-65	-75	-75
	4X	-1.9	-39	-72	-77	-77
	3X	-2.8	-29	-68	-66	-74
	3X	7.1	-30	-70	-77	-75
Harmonic	2X	7.0	-27	-37	-68	-74
of LO (n)	2X	11.8	-27	-47	-75	-75
	1X	4.5	0	-48	-69	-74
	1X	11.8	0	-58	-76	-76
	0X	N/A	-5	-34	-69	-70
	0X	N/A	-5	-46	-75	-70
		0X	1X	2X	3X	4X

Harmonic of RFIN (m)

The spurious table shows the spurious signals resulting from the mixing of the RFIN and LO input signals, assuming down conversion. The number of dB below the conversion loss level indicates the mixing products. The lower frequency mixing term is shown for two different input levels. The top number is for an RFIN power level of -19 dB; the lower number is for -29 dB. Assuming the LNA gain is approximately 14 dB, the mixer input will see approximately -5 dB and -15 dB.

$ mF_{RF} - nF_{LO} $, RF = -19 dB	RF = 1850 MHz
$ mF_{RF} - nF_{LO} $, RF = -29 dB	LO = 1710 MHz

Part	Value	Purpose
C1	47 pF	DC Block
C2	47 pF	By-pass
C3	3.3 pF	LO Port Matching Network
L1	3.9 nH	Tuning
L2	3.0 nH	LO Port Matching Network
L3	12 nH	RF Choke
R1	See Note 16	Optional Current Control
R2	5.1 k Ohms	DC Return
R3	330 Ohms	LO Port Matching Network

External Circuitry Parts ¹⁵

 All external circuitry parts are readily available, low cost surface mount components (.060 in. x .030 in. or .080 in. x .050 in.).

 Pin 2 allows use of an external resistor to ground for optional higher current. For 20 mA operation, no resistor is used.

For $I_{DD} \approx 30$ mA, R2 = 43 Ohms For $I_{DD} \approx 45$ mA, R2 = 15 Ohms For $I_{DD} \approx 60$ mA, R2 = 10 Ohms

3

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are North America Tel: 800.366.2266
 Europe Tel: +353.21.244.6400
 India Tel: +91.80.4155721
 China Tel: +86.21.2407.1588

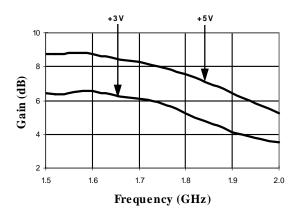
Visit www.macomtech.com for additional data sheets and product information.

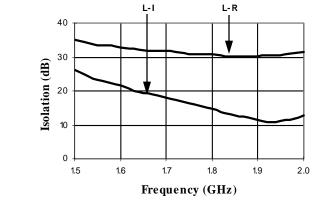
Commitment to produce in volume is not guaranteed.

Down Converter 1500 — 2400 MHz

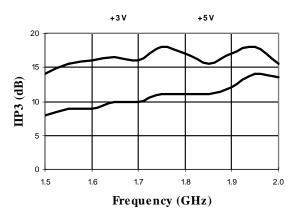
Typical Performance Curves

Gain



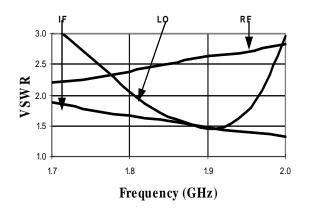


IIP3



VSWR at +3V

Isolation at +3V



ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are

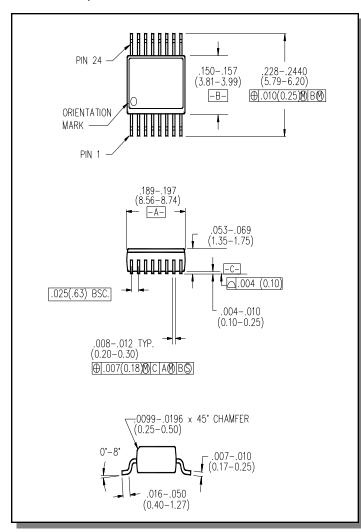


Rev. V1

typical. McCoM Technology Solutions has been development. I without a been development and the solution of the

Down Converter 1500 — 2400 MHz

Lead-Free, QSOP-16[†]



t Reference Application Note M538 for lead-free solder reflow recommendations.

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions • North America Tel: 800.366.2266 • Europe Tel: +353.21.244.6400 is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. • India Tel: +91.80.4155721 Visit www.macomtech.com for additional data sheets and product information. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are Commitment to produce in volume is not guidenteed. MA-COM Technology Soutions nor an one offiliates reserve the right to make changes to the production of the information contained herein without notice. t us a may be available.

changes to the proc



• China Tel: +86.21.2407.1588

Rev. V1

5