

Features

- Single Supply Voltage
- Covers International RFID Bands
 - 902 - 928 MHz, US
 - 865 - 868 MHz, EU
 - 948 - 958 MHz, Japan
- High Gain 3 Stage HBT Design
- High Efficiency: 50 %
- Lead-Free 3 mm 16-Lead PQFN Package
- 100% Matte Tin Plating
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

M/A-COM's MAAPSS0095 is a high power three stage HBT power amplifier tuned to operate in the RFID bands in the US, the EU and Japan.

The MAAPSS0095 can also be used in other applications where high power and high efficiency are required, such as remote meter reading, electronic vehicle toll systems and ISM applications at 900 MHz. The high power and efficiency at 3.3 V make the MAAPSS0095 ideal for mobile applications.

The MAAPSS0095 is packaged in a lead-free 3 mm, 16-lead PQFN package and includes bias networks that can be controlled by analog signals to switch from active to standby modes.

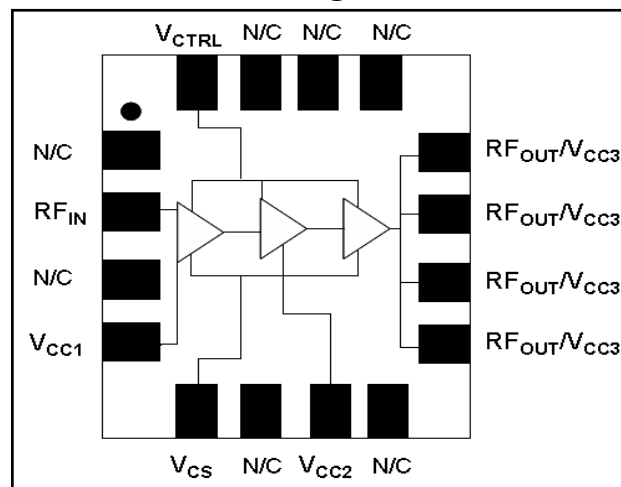
M/A-COM fabricates the MAAPSS0095 using a proprietary InGaP/GaAs HBT process for improved performance over temperature, higher reliability, and improved manufacturability.

Ordering Information¹

Part Number	Package
MAAPSS0095TR	1000 piece reel
MAAPSS0095TR-3000	3000 piece reel
MAAPSS0095SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

Functional Block Diagram



Pin Configuration

Pin	Pin Name	Description
1	N/C	No Connection
2	RF _{IN}	RF Input
3	N/C	No Connection
4	V _{CC1}	1st Stage Supply
5	V _{CS}	Bias Supply Voltage
6	N/C	No Connection
7	V _{CC2}	2nd Stage Supply
8	N/C	No Connection
9	RF _{OUT} /V _{CC3}	RF Output, 3rd Stage Supply
10	RF _{OUT} /V _{CC3}	RF Output, 3rd Stage Supply
11	RF _{OUT} /V _{CC3}	RF Output, 3rd Stage Supply
12	RF _{OUT} /V _{CC3}	RF Output, 3rd Stage Supply
13	N/C	No Connection
14	N/C	No Connection
15	N/C	No Connection
16	V _{CTRL}	Control Voltage
17	Paddle ²	RF & DC Ground

2. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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

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 typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

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RF Power Amplifier for RFID
850 - 960 MHz

Rev. V1

General Electrical Specifications³: $T_C = +25^\circ\text{C}$, $V_{CC} = V_{CS} = +3.3\text{ V}$, $P_{IN} = +5\text{ dBm}$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Input impedance		Ohms	—	50	—
Input VSWR		Ratio	—	2.0:1	—
Control voltage range		V	0.2	—	2.7
Control voltage slope	$0 \leq P_{OUT} \leq 32\text{ dBm}$	dB/V	—	45	—
Duty cycle		%	—	100	—
Off current	$V_{CTRL} = +0.2\text{ V}$	μA	—	20	—
Control current	$V_{CTRL} = +2.6\text{ V}$, $P_{IN} = +5\text{ dBm}$	mA	—	4	—

3. Operating at or within these electrical bias conditions, at case temperatures up to 85°C , will ensure $\text{MTTF} > 5 \times 10^6$ hours.

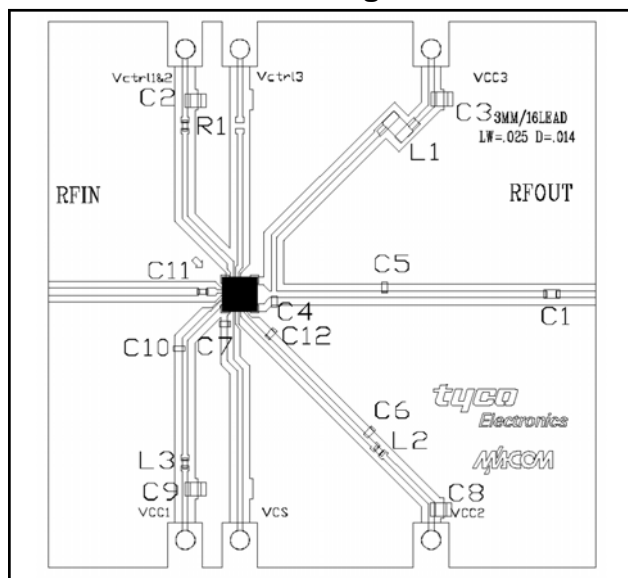
Electrical Specifications: $T_C = +25^\circ\text{C}$, $Z_0 = 50\ \Omega$, $F = 960\text{ MHz}$, $V_{CC} = V_{CS} = 3.3\text{ V}$, $V_{CTRL} = 2.6\text{ V}$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Output power	$P_{IN} = +5\text{ dBm}$	dBm	32.0	32.5	—
Power added efficiency	$P_{IN} = +5\text{ dBm}$	%	50	55	—
Input Return Loss	$P_{IN} = -25\text{ dBm}$	dB	—	12	—
Output Return Loss	$P_{IN} = -25\text{ dBm}$	dB	—	12	—
Harmonics	$P_{IN} = +5\text{ dBm}$	dBc	—	-45	—
Small Signal Gain	$P_{IN} = -25\text{ dBm}$	dB	35	37	—
Current	$P_{IN} = -25\text{ dBm}$	mA	100	180	250

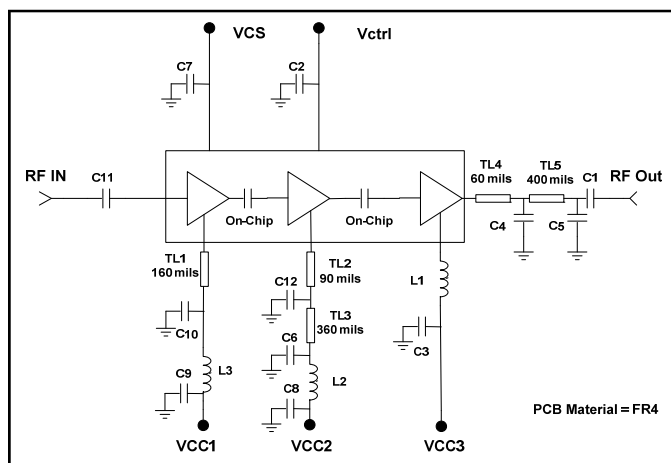
Absolute Maximum Ratings

Parameter	Specifications				Remarks
	Units	Min.	Typ.	Max.	
V_{CC1} , V_{CC2} , V_{CC3} and V_{CS}	V	-0.5	—	6.0	No operation
V_{CTRL}	V	-0.5	—	3.8	
Input power	dBm	—	—	+8	
Operating duty cycle	%	—	—	100	
Operating temperature	$^\circ\text{C}$	-40	—	85	Measured at ground lead
Storage temperature	$^\circ\text{C}$	-20	—	125	

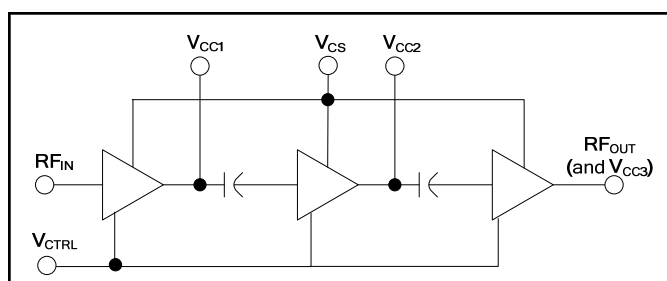
Evaluation Board Configuration



Evaluation Board Schematic



Functional Schematic



MAAPSS0095 External Parts List

Component	Value	Foot Print	Manufacturer
C1, C7, C11	100 pF	0402	Murata
C2, C3, C8, C9	3.3 μ F	1208	Kemet
C4	20 pF	603	ATC 600 S
C5	8.2 pF	603	ATC 600 S
C6, C10	1000 pF	0402	Murata
C12	39 pF	603	ATC 600 S
L1	5.6 nH	-	Coilcraft 0906-5J
L2, L3	22 nH	0402	Toko
R1	0 Ohms	0402	-
TL1	50 Ω , 8° @ 900 MHz		
TL2	50 Ω , 4.4° @ 900 MHz		
TL3	50 Ω , 17.5° @ 900 MHz		
TL4	50 Ω , 2.9° @ 900 MHz		
TL5	50 Ω , 19.5° @ 900 MHz		

Handling Procedures

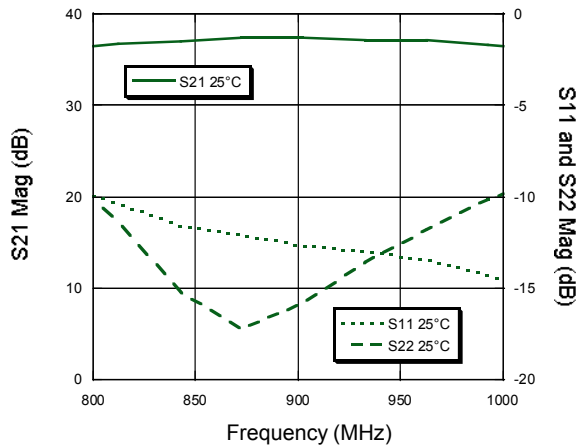
Please observe the following precautions to avoid damage:

Static Sensitivity

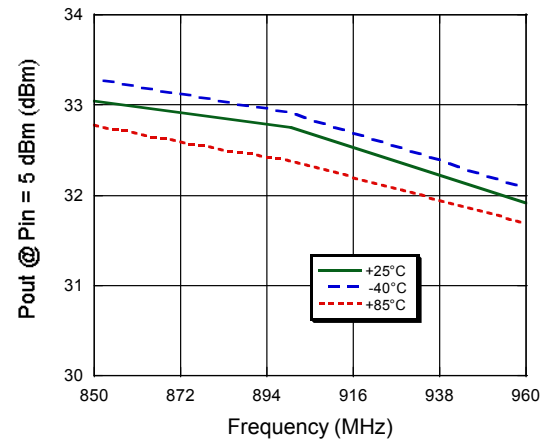
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves:

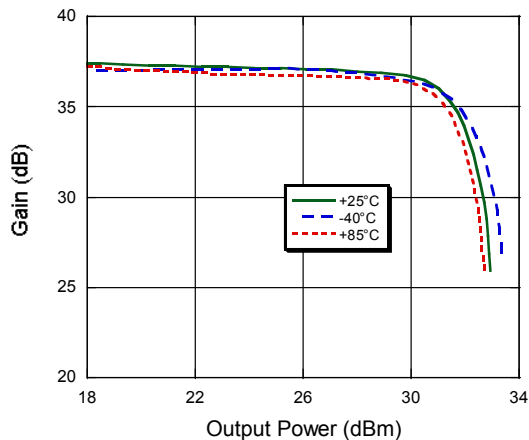
S11, S21 and S22



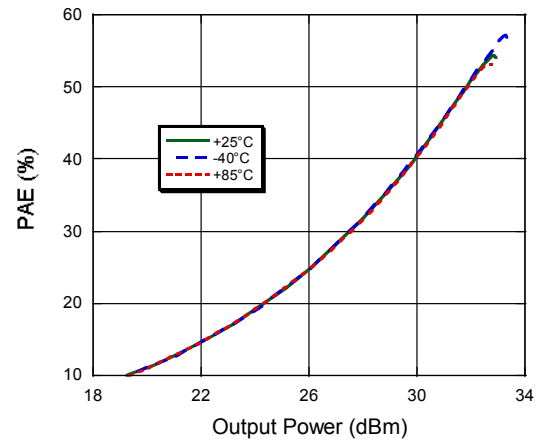
P_{OUT} @ $P_{in} = 5$ dBm



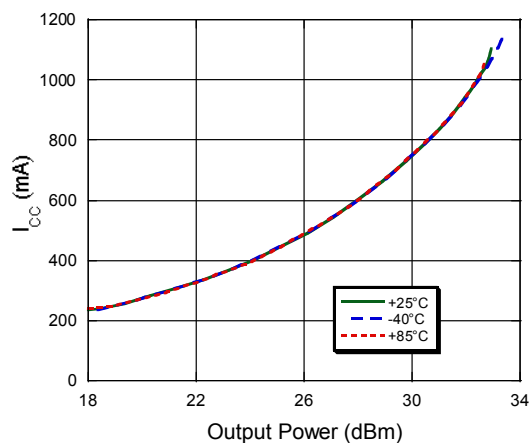
P1dB @ 900 MHz



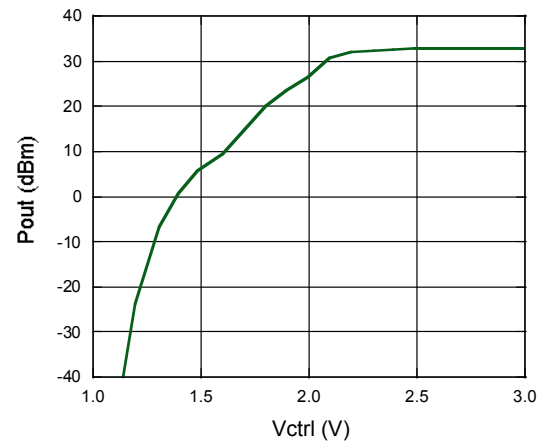
PAE @ 900 MHz



I_{CC} vs. P_{OUT} @ 900 MHz



P_{OUT} vs. V_{CTRL} @ 900 MHz



Rev. V1

Figure 1: Dimensions of the package. The figure consists of three views: a top view, a side view, and a front view. The top view shows a square package with a 16-pin configuration. Dimensions include a width of 1.181 inches (3.00 mm), a height of 0.020 inches (0.000 inches), and a pin pitch of 0.05 inches (0.00 inches). The side view shows a height of 0.020 inches (0.000 inches) and a pin pitch of 0.05 inches (0.00 inches). The front view shows a width of 0.020 inches (0.000 inches) and a pin pitch of 0.05 inches (0.00 inches).

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