1.25 W VSAT Power Amplifier
13.75—14.5 GHz

MAAPSS0111
V2P

Features

- Saturated Output Power: 31 dBm Typical
- High Linear Gain: 34 dB Typical
- High Power Added Efficiency: 31 % at P_{SAT}
- 50 Ω Input / Output Match
- Lead-Free 6 mm 28-lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAAPSS0111 is a four stage MMIC power amplifier designed specifically for Ku-Band VSAT applications. It can be used as either a driver or an output stage amplifier. The MAAPSS0111 is fully matched input and output to 50 ohms which eliminates any sensitive external RF tuning components. The device is packaged in a lead free 6 mm 28-lead PQFN leadless package for high volume manufacturing.

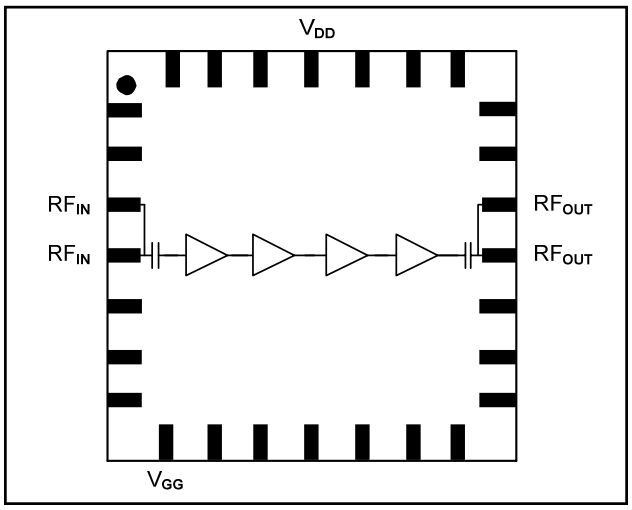
The MAAPSS0111 is fabricated using a high reliability self-aligned gate MESFET process, MSAG, to realize good power added efficiency and gain. The MSAG process features full passivation for high performance and reliability.

Ordering Information [1]

Part Number	Package
MAAPSS0111TR-3000	13 inch, 3000 piece reel
MAAPSS0111SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

DC Pin	Function	DC Pin	Function
1	GND	15	GND
2	GND	16	GND
3	RF_{IN}	17	GND
4	RF_{IN}	18	RF_{OUT}
5	GND	19	RF_{OUT}
6	GND	20	GND
7	GND	21	GND
8	V_{GG}	22	GND
9	GND	23	GND
10	GND	24	GND
11	GND	25	V_{DD}
12	GND	26	GND
13	GND	27	GND
14	GND	28	GND
		29	Paddle [2]

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

This PRELIMINARY Data Sheet contains information regarding a product M/A-COM has under development. Performance is based on measured results and target specifications. Commitment to produce in volume is not guaranteed.

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

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Electrical Specifications: V_{DD} = 8 V, I_{DQ} = 400 mA, T_A = 25 °C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Frequency		GHz	13.75	—	14.5
Input Return Loss	—	dB	—	-16	—
Output Return Loss	—	dB	—	-12	—
Gain	—	dB	—	34	—
Gain Flatness	—	dB	—	1	—
P_{SAT}	—	dBm	—	31	—
Current	I_{DQ} P_{SAT}	mA mA	— —	400 530	—- —
PAE	P_{SAT}	%	—	31	—
Gate Bias	Voltage Current under saturation	V mA	—	-1.9 0.2	—
Duty Cycle	—	%	—	—	100
Stability	+2.5V < V_{CC} < +8.0 V, P_{OUT} = saturated, VSWR < 5:1, -40°C < T_C < +85 ºC, RBW = 3 MHz max hold		All spurs < -60 dBc		

Operating the MAAPSS0111

The MAAPSS0111 is static sensitive. Please handle with care. To operate the device, follow these steps. Ramp down or shutdown in reverse order (gate bias on first and off last).

1. Apply V_{GG} (-2.0 V).
2. Apply V_{DD} (8.0 V Typical).
3. Set I_{DQ} by adjusting V_{GG}.
4. Apply RF_{IN}.

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.

Absolute Maximum Ratings [3,4]

Parameter	Absolute Maximum
Input Power	+10 dBm
Operating Supply Voltage	+10 Volts
Operating Gate Voltage	-3 Volts
Operating Base Temperature	-40°C to +85°C
Channel Temperature	+160 °C
Storage Temperature	-40°C to +150°C

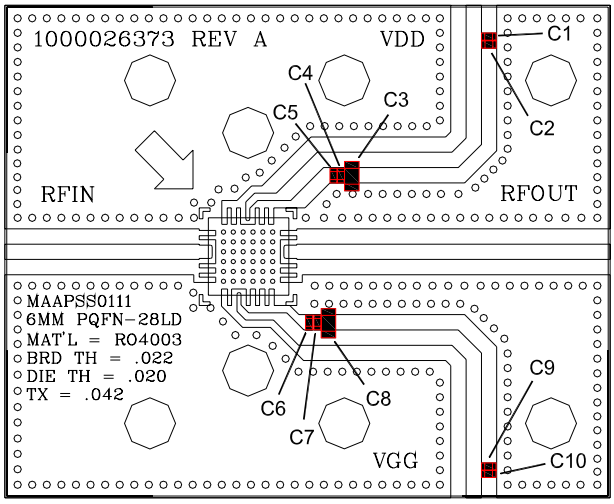
3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. M/A-COM does not recommend sustained operation near these survivability limits.

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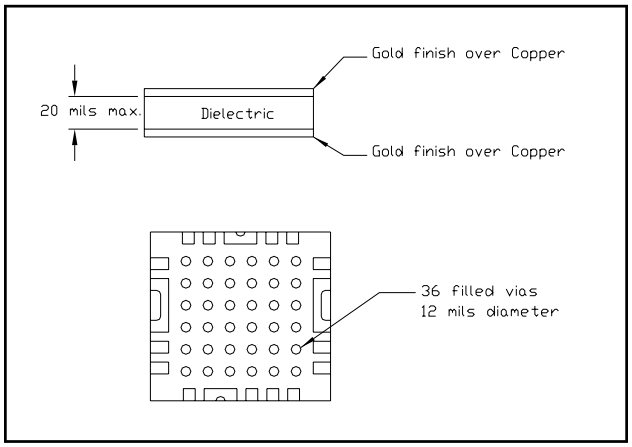
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Evaluation Test Board



Cross Section View



External Parts List

Designator	Value	Foot Print
C1, C10	1 uF	0402
C2, C9	10 pF	0402
C3, C8	10 uF	0804
C4, C7	0.1 uF	0402
C5, C6	100 pF	0402

Notes on board design:

1. A low loss dielectric material such as Rogers 4003, e_r = 3.38, is recommended for this application.
2. A substrate thickness of 20 mils (0.508 mm) maximum is recommended to minimize thermal resistance and ground impedances.
3. RF transmission line impedance must be 50 ohms (w = 42 mils (1.0668 mm) for t = 20 mils (0.508 mm), Rogers 4003).
4. The board must provide low thermal resistance from package base to heat sink to accommodate the 3 W typical power dissipation.
5. Metal foil thickness in the vias is critical to thermal resistance. The recommended metalization is 1 oz (35 mm minimum thickness).
6. The application board is configured with 36 vias, each 12 mil (0.3048 mm) in diameter beneath the package base. Conductive via fill material is recommended to minimize thermal resistance and to prevent solder from wicking into vias.
7. The exposed package pad must be properly soldered to the board.
8. Case temperature is measured at the interface between the package bottom and circuit board.

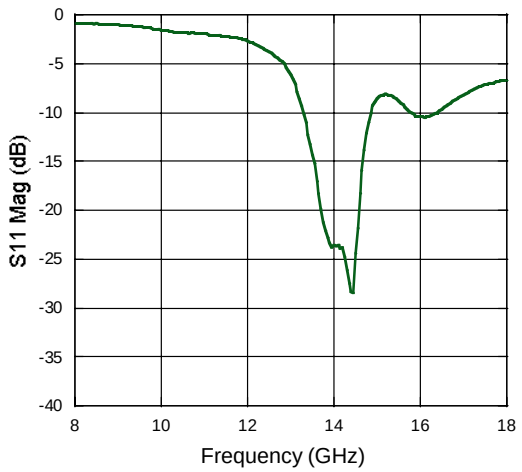
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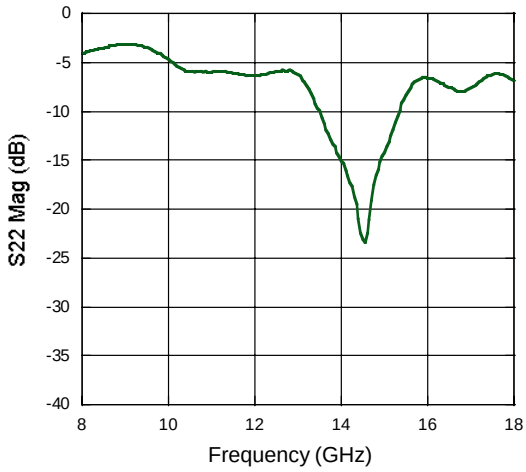
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Performance Curves: V_{DD} = 8 V, I_{DQ} = 450 mA, T_A = 40 °C, Z_0 = 50 Ω

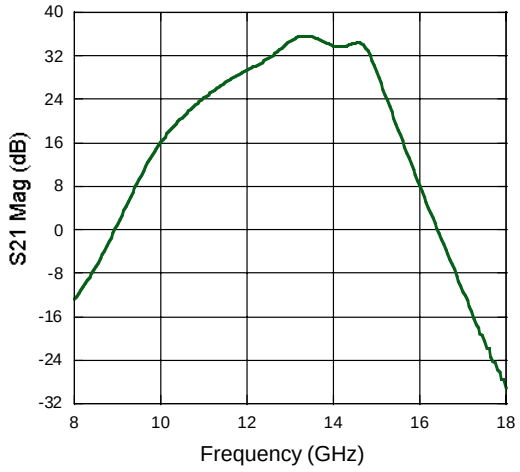
Input Return Loss



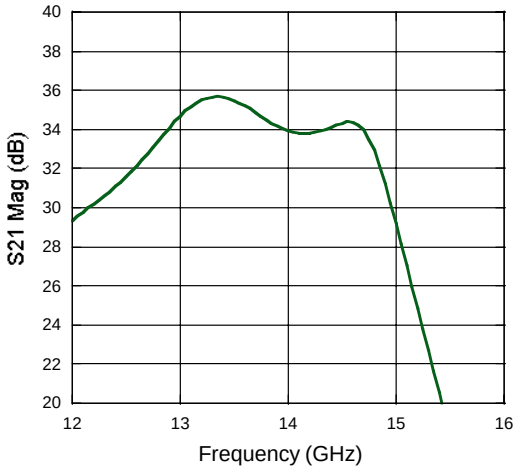
Output Return Loss



Gain



Gain, 12 - 16 GHz



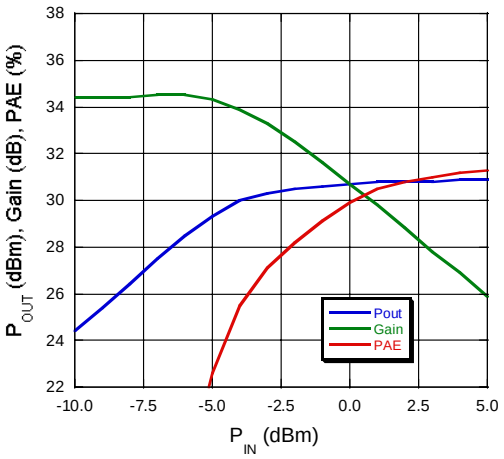
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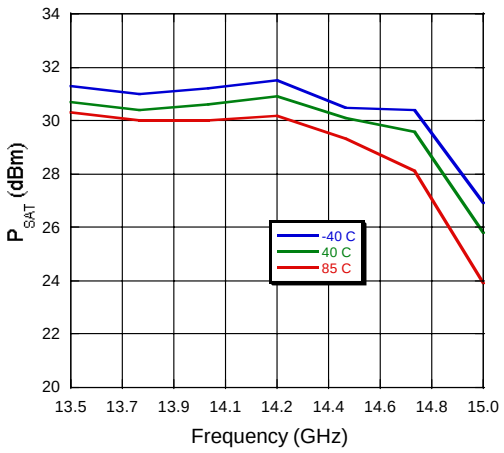
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Typical Performance Curves: V_{DD} = 8 V, I_{DQ} = 400 mA, T_A = 40 °C, Z_0 = 50 Ω

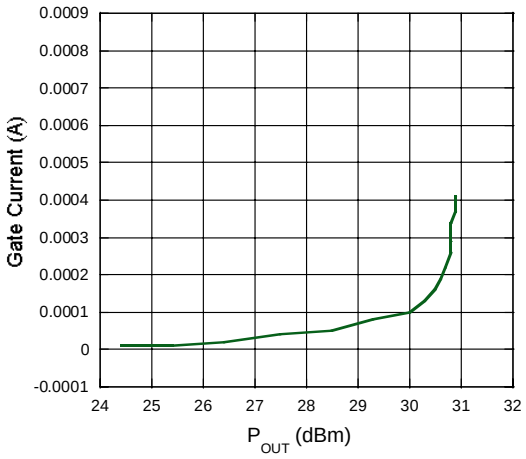
P_{out}, Gain, PAE vs. P_{IN} @ 14.25 GHz



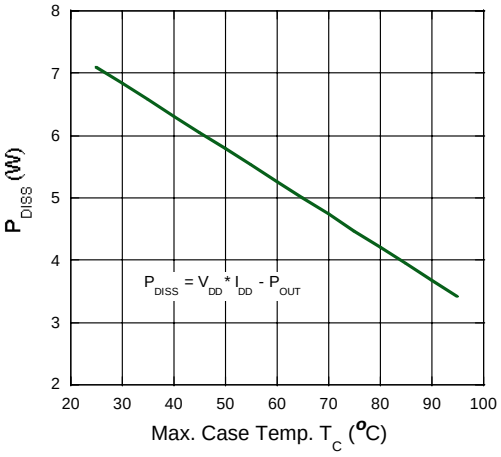
P_{SAT} vs. Frequency, P_{IN} = 4 dBm



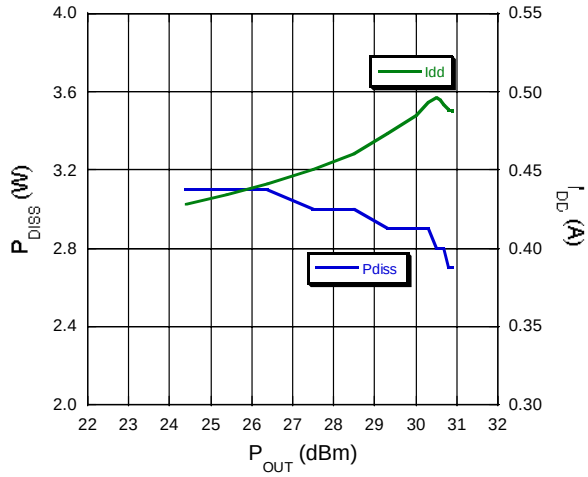
Gate Current vs. P_{OUT}



P_{DISS} vs. Max. Case Temperature



P_{DISS}, IDD vs. P_{out} @ 14.25 GHz

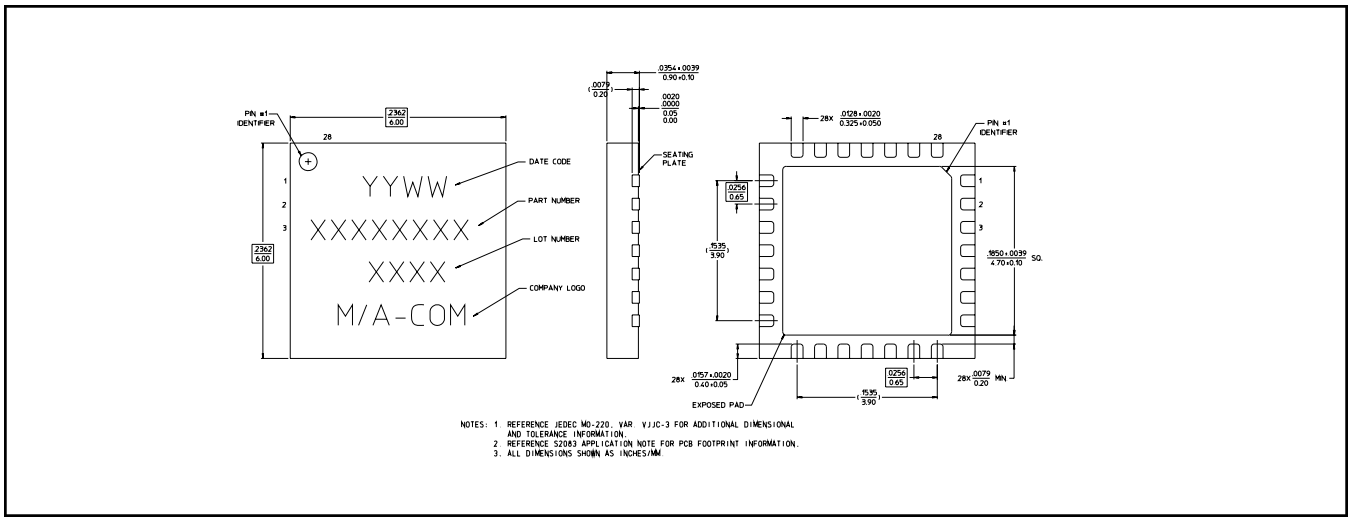


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Lead-Free 6 mm 28-Lead PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

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