

# 13.50-14.50 GHz 2.5-Watt Power Amplifier

Mimix  
BROADBAND™

February 2007 - Rev 19-Feb-07

CMM1434-SM  
RoHS

## Features

- ✕ 34.5 dBm (Typ.) Saturated Output Power
- ✕ 31.0 dB (Typ.) Linear Gain
- ✕ Fully Matched
- ✕ Unconditionally Stable
- ✕ Low-Cost, Surface Mount Package
- ✕ Optimum Thermal Dissipation

## General Description

The CMM1434-SM is a four-stage pHEMT GaAs MMIC power amplifier that is ideally suited for transmit subsystems designed for Ku-Band VSAT applications. The CMM1434-SM provides 31.0 dB linear gain and delivers 2.5 watts of output power at saturation operating from 13.5 to 14.5 GHz frequency.

The unconditional stability and internal matching provides for reduction of external components making this product a simple and low-cost solution. The low-cost 6mm x 6mm x 1.6mm surface mount package offers the same excellent RF and thermal properties as a typical flange package.



## Applications

- ✕ Ku-Band VSAT Transmit Subsystems

## Electrical Characteristics (T = +25°C, Vd = 6V, Idq = 1.5A)

Parameter	Condition	Min	Typ	Max	Units
Frequency Range		13.50		14.50	GHz
Output Power	@ 1dB compression	31.5	32		dBm
Saturated Output Power	Pin = 10 dBm	33	34.5		dBm
Saturated Output Power Variation	Over operating frequency		0.5	1.0	dBm
Linear Gain		27.0	30.5	34.0	dB
Linear Gain Variation	Over operating frequency		1.0	3.0	dB
Input Reflection Coefficient			-10.0		dB
Output Reflection Coefficient			-7.0		dB
Gate Supply Voltage	Idq = 1.5A	-1.1	-0.9	-0.7	Volts
Drain Current	At Saturation		1.7	1.9	A
Power Added Efficiency	At Saturation		26		%

## Electrical Specifications (TA = -40°C to +75°C)

Parameter	Condition	Min	Typ	Max	Units
Saturated Output Power	Variation from Room Temperature	-0.5			dBm
Linear Gain	Variation from Room Temperature	-2.5		3.5	dB
Stability		Unconditionally stable			

## Maximum Ratings (TA = -40°C to +75°C)

Operation outside these limits can cause permanent damage.

Parameter	Typ	Units	Parameter	Typ	Units
Drain Voltage (+V <sub>dd</sub> )	8.5	Volts	RF Input Power (P <sub>in</sub> )	15	dBm
Gate Voltage (V <sub>gg</sub> )	-3.0	Volts	Dissipated Power (P <sub>diss</sub> )	10	Watts
Quiescent Current (I <sub>dq</sub> )	2.1	A	Storage Temperature	-50 to +150	°C
Gate Current (I <sub>g</sub> )	5	mA	Operating Backside Temperature	-40 to +75	°C

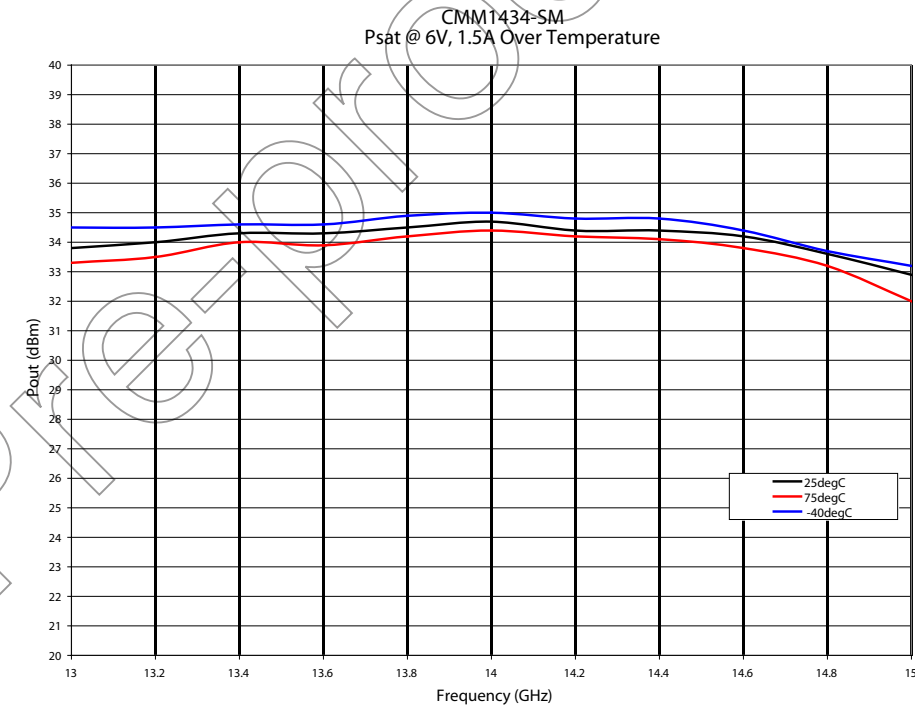
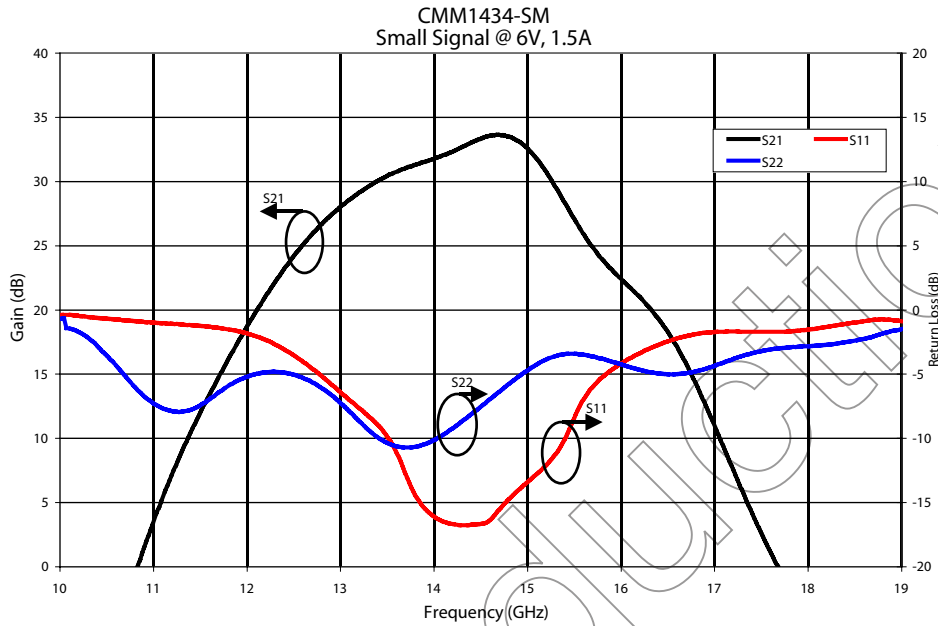
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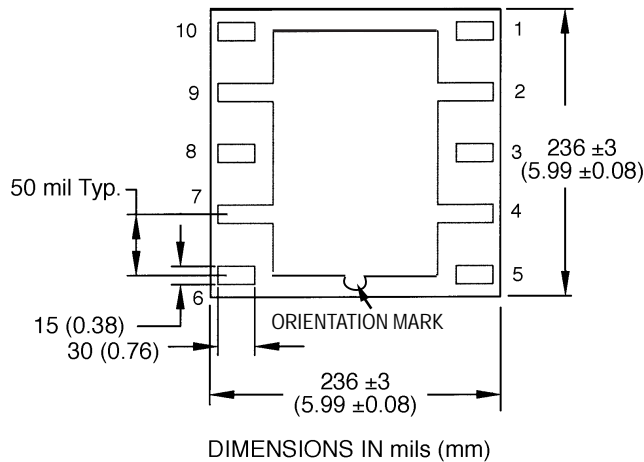
# 13.50-14.50 GHz 2.5-Watt Power Amplifier

## Power Amplifier Measurements



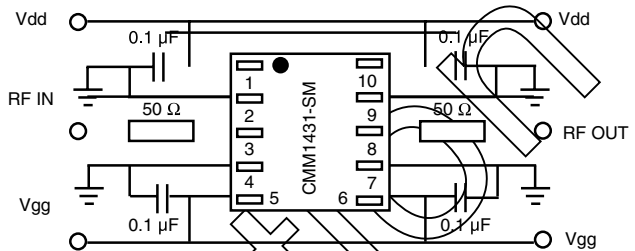
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## Physical Dimensions (Bottom View)



## Recommended Application Circuit

Note: This schematic represents the topology of the application circuit recommended by Celeritek.

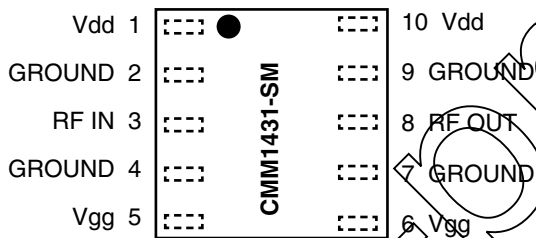


Note: Due to the high gain of this device it is highly recommended to maintain the reverse isolation (S12) above 50 dB.

### Biasing Notes

1. Dual bias is required
2. 0.1µF bypass capacitors are needed on PC board as close as possible to pins 1, 5, 6 and 10.
3. Positive (+) bias can be applied either at pin 1 or pin 6.
4. Negative (-) bias can be applied either at pin 5 or pin 6.
5. No DC block is required at RF IN/OUT.
6. Negative (-) bias must be applied before applying positive (+) bias.

## Pin Functional Diagram



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## Handling and Assembly Information

**CAUTION!** - Mimix Broadband MMIC Products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not ingest.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

**Life Support Policy** - Mimix Broadband's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President and General Counsel of Mimix Broadband. As used herein: (1) Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. (2) A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**ESD** - Gallium Arsenide (GaAs) devices are susceptible to electrostatic and mechanical damage. Die are supplied in anti-static containers, which should be opened in cleanroom conditions at an appropriately grounded antistatic workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.

**Die Attachment** - GaAs Products from Mimix Broadband are 0.100 mm (0.004") thick and have vias through to the back-side to enable grounding to the circuit. Microstrip substrates should be brought as close to the die as possible. The mounting surface should be clean and flat. If using conductive epoxy, recommended epoxies are Ablestick 84-1LMI or 84-1LMI cured in a nitrogen atmosphere per manufacturer's cure schedule. Apply epoxy sparingly to avoid getting any on to the top surface of the die. An epoxy fillet should be visible around the total die periphery. If eutectic mounting is preferred, then a fluxless gold-tin (AuSn) preform, approximately 0.001<sup>2</sup> thick, placed between the die and the attachment surface should be used. A die bonder that utilizes a heated collet and provides scrubbing action to ensure total wetting to prevent void formation in a nitrogen atmosphere is recommended. The gold-tin eutectic (80% Au 20% Sn) has a melting point of approximately 280° C (Note: Gold Germanium should be avoided). The work station temperature should be 310° C +/- 10° C. Exposure to these extreme temperatures should be kept to minimum. The collet should be heated, and the die pre-heated to avoid excessive thermal shock. Avoidance of air bridges and force impact are critical during placement.

**Wire Bonding** - Windows in the surface passivation above the bond pads are provided to allow wire bonding to the die's gold bond pads. The recommended wire bonding procedure uses 0.076 mm x 0.013 mm (0.003" x 0.0005") 99.99% pure gold ribbon with 0.5-2% elongation to minimize RF port bond inductance. Gold 0.025 mm (0.001") diameter wedge or ball bonds are acceptable for DC Bias connections. Aluminum wire should be avoided. Thermo-compression bonding is recommended though thermosonic bonding may be used providing the ultrasonic content of the bond is minimized. Bond force, time and ultrasonics are all critical parameters. Bonds should be made from the bond pads on the die to the package or substrate. All bonds should be as short as possible.

## Ordering Information

The CMM1434-SM is available in tube or tape and reel.

Part Number for Ordering	Package
CMM 1431-SM	Surface mount package
CMM1434-SM-0G0T	Matte tin plated RoHS compliant surface mount package in tape and reel
PB-CMM1434-SM	Evaluation Board

We also offer this product with SnPb (Tin-Lead) or NiPdAu plating. Please contact your regional sales manager for more information regarding different plating types.