Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com

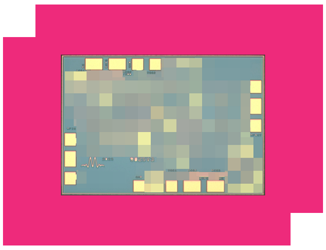
AMM-9025CH

0.01 - 65GHz mmWave GaAs Driver Amplifier

DEVICE OVERVIEW

General Description

The AMM-9025CH is a wideband distributed low noise amplifier capable of providing 14 dB gain from 10MHz to 65 GHz and a low 2.8 dB typical noise figure from 7 to 30GHz. The ADM-9025CH is an ideal linear signal amplifier for applications requiring low power consumption and small form-factors. AMM-9025CH is DC coupled with the low end limited by the blocking capacitors. The amplifier has excellent return losses and gain flatness in a small wirebondable 1.75 x 1.2 mm die.



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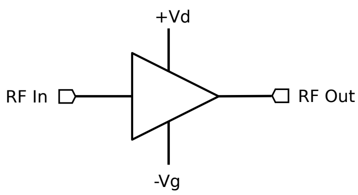
Features

- Ultra-broadband operation (0.01-65GHz)
- Very flat gain response
- Excellent return losses
- DC coupled RF input and output

Applications

- Test and Measurement Equipment
- SATCOM
- LO signal chain for mmWave mixers
- Radar
- Electronic warfare equipment
- Aerospace and Defense

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
AMM-9025CH	0.01 - 65GHz mmWave GaAs Driver Amplifier	CH	REACH RoHS	Released	3A001.b.2.d

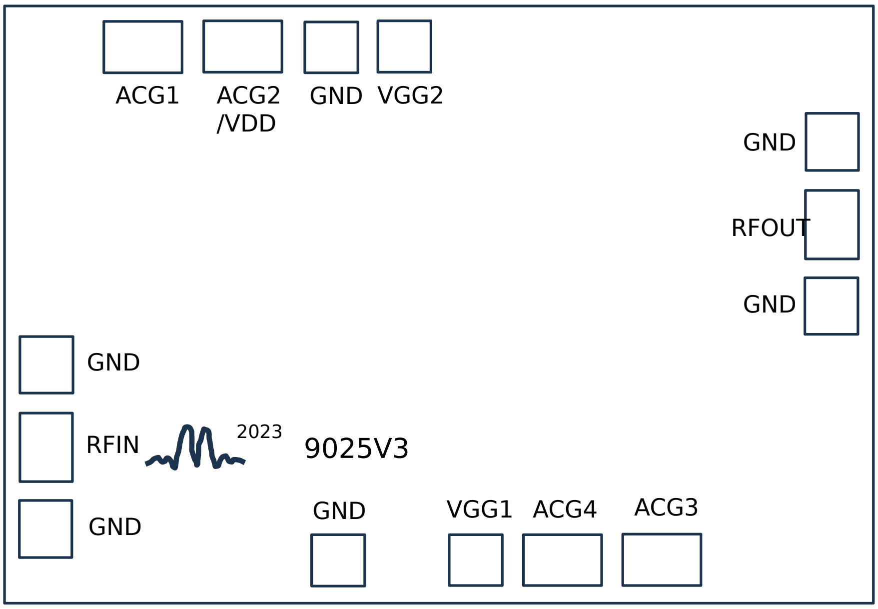
Table Of Contents

Revision History

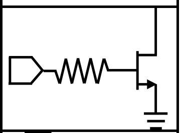
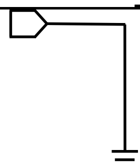
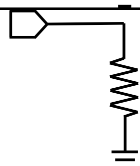
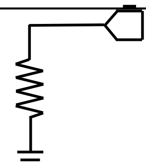
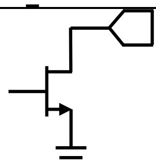
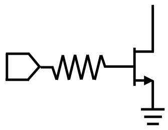
Revision Code	Revision Date	Comment
-	2024-07-09	Initial Release

Port Configuration and Functions

Port Diagram



Port Functions

Port	Function	Description	DC Equivalent Circuit
ACG1	AC Ground	This pad should be attached to off-chip bypass capacitors. The recommended bypassing for this pad is 0.1uF+100pF. Do not Ground this pad.	-
ACG3	AC Ground	This pad should be attached to off-chip bypass capacitors. The recommended bypassing for this pad is 0.1uF+100pF. Do not ground this pad.	-
ACG4	AC Ground	This pad should be attached to off-chip bypass capacitors. The recommended bypassing for this pad is 0.1uF+100pF. Do not ground this pad. For simplified application circuits, -Vg may be applied through this pad instead of VGG1 pad.	
GND	Ground	The bottom side of the die must be connected to a DC/RF ground with high thermal and electrical conductivity. There is no need to bond the GND pads on the top surface of the die.	
RF In	RF Input	This is the amplifiers RF input pad. This pad requires an external DC blocking capacitor as shown in the application schematic. This pad is internally RF matched to 50 Ohms.	
RF Out	RF Output	This is the amplifiers RF output pad. this pad requires an external DC blocking capacitor as shown in the application schematic. This pad is internally RF matched to 50 Ohms.	
VDD/ACG2	Drain Supply Voltage	This pad provides DC power to the drain of the amplifier. This pad can share 0.1uF+100pF bypass capacitors with ACG1 pad. The DC voltage at this pin should be set to 6V for normal operation.	
VGG1	Gate Bias Voltage	This pad provides DC bias to the gate of the amplifier. This pin requires a negative bias voltage for normal operation. The drain current Id of the amplifier will be controlled by the voltage applied to this pin. As this voltage becomes more positive, drain current will increase. For normal operation, the voltage on this pin should be set to produce a drain current of 65mA.	
VGG2	NC	No connect. Do not connect or ground this pad.	-

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may become inoperable or have a reduced lifetime. Reliability limits are individual, instantaneous catastrophic limits only. Functional operation limits are indicated below. Operation of the device at multiple absolute maximum limits or for extended periods at a single limit can cause degradation and damage to the device.

Parameter	Maximum Rating	Unit
Gate Voltage (Vg)	-1.5	V
Input Power	15	dBm
Maximum Operating Temperature for MTTF > 1E6 hours	85	°C
Minimum Operating Temperature for MTTF > 1E6 hours	-40	°C
Positive Drain Supply Current (Id) (with RF Input)	98	mA
Positive Drain Supply Voltage (Vd)	7	V

Package Information

Parameter	Details	Rating
Dimensions	-	1.75x1.2mm

Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications. Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the Electrical Specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

Parameter	Min	Nominal	Max	Unit
Positive DC Voltage (Vd)	-	6	-	V
Positive Supply Current	-	65	-	mA

Sequencing Requirements

Turn-on Procedure:
1: Apply Vg = -0.5V (VGG1 pad)
2: Apply Vd voltage (VDD/ACG2 pad)
3: Increase Vg voltage towards -0.2V to achieve Id=65mA.
4: Apply RF input Power
Turn-off Procedure:
1: Turn off RF input Power
2: Turn off Vd voltage (VDD/ACG2 pad)
3: Turn off Vg voltage (VGG1 pad)

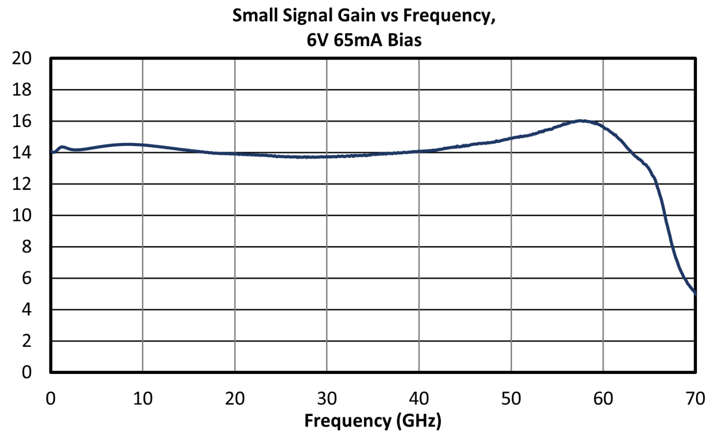
Electrical Specifications

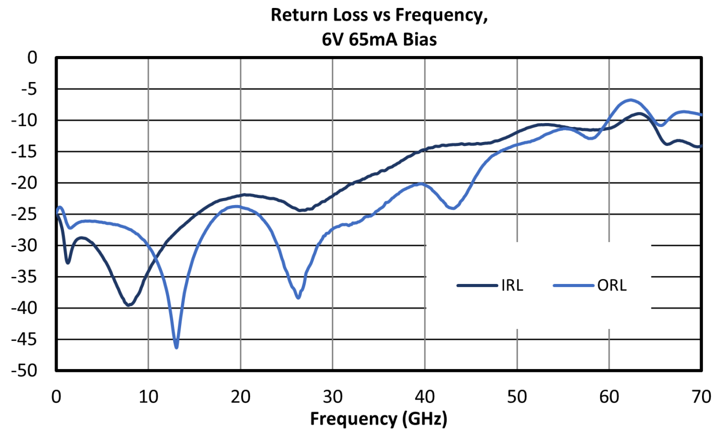
Unless otherwise specified, electrical specifications apply at TA=+25°C, Vd=6V and Vg such that Id=65mA.

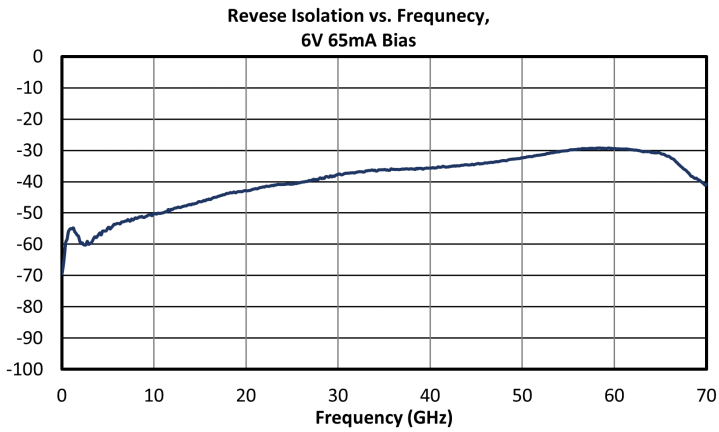
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Input Return Loss	Vd=6V,Id=65mA,Pin=-20dBm	0.01	65	-	20	-	dB
Noise Figure	Vd=6V,Id=65mA,Pin=-20dBm	0.01	7	-	4.2	-	dB
Noise Figure	Vd=6V,Id=65mA,Pin=-20dBm	7	30	-	2.8	-	dB
Noise Figure	Vd=6V,Id=65mA,Pin=-20dBm	30	50	-	4.4	-	dB
Output IP2	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	10	30	-	22	-	dBm
Output IP2	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	30	34	-	25	-	dBm
Output IP2	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	0.01	10	-	28	-	dBm
Output IP3	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	0.01	30	-	26	-	dBm
Output IP3	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	50	65	-	18	-	dBm
Output IP3	Vd=6V,Id=65mA,Pin=-15 dBm per tone, 1 MHz tone spacing	30	50	-	23	-	dBm
Output P1dB	Vd=6V,Id=65mA	0.01	20	-	14	-	dBm
Output P1dB	Vd=6V,Id=65mA	50	65	-	7.5	-	dBm
Output P1dB	Vd=6V,Id=65mA	20	50	-	11	-	dBm
Output Return Loss	Vd=6V,Id=65mA,Pin=-20dBm	0.01	65	-	24	-	dB
Reverse Isolation	Vd=6V,Id=65mA,Pin=-20dBm	0.01	65	-	37	-	dB
Small Signal Gain	Vd=6V,Id=65mA,Pin=-20dBm	0.01	65	-	14	-	dB

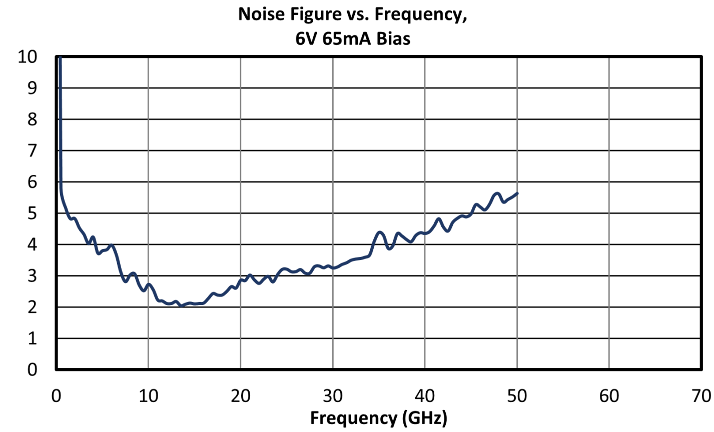
Performance plots measured using the recommended application circuit shown below.

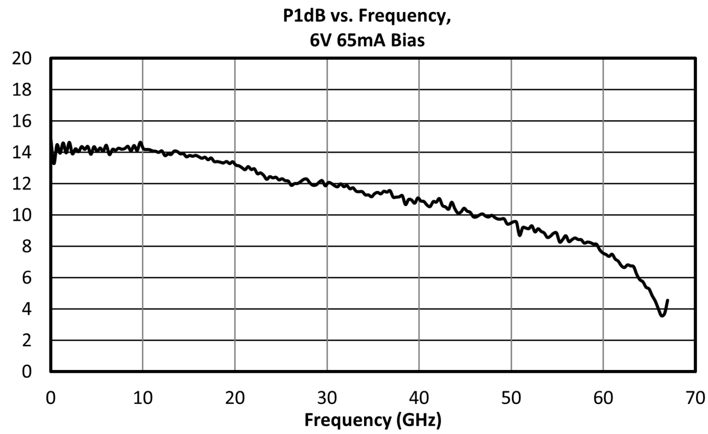
Typical Performance Plots

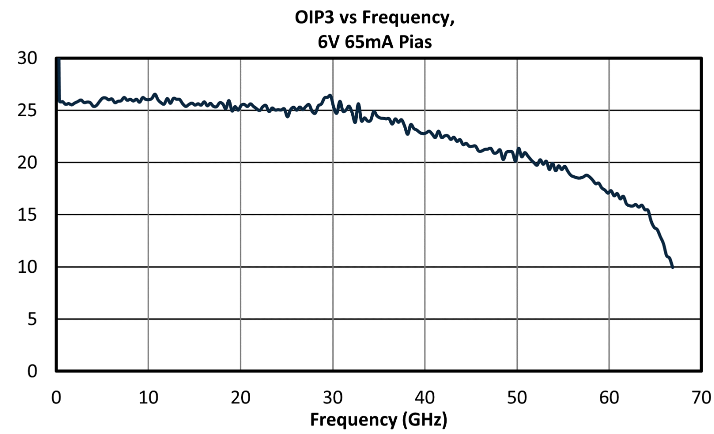


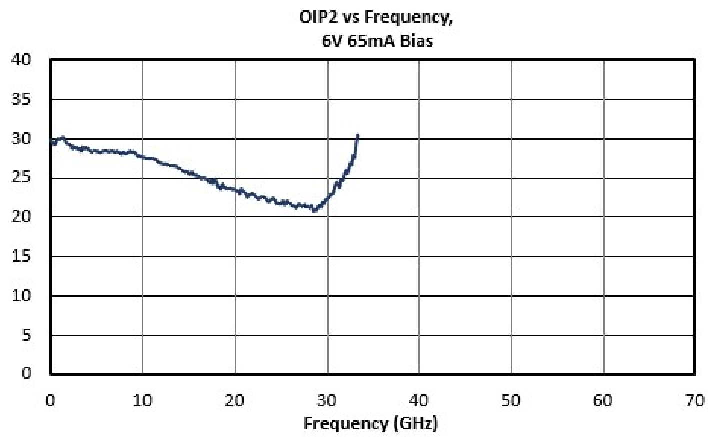




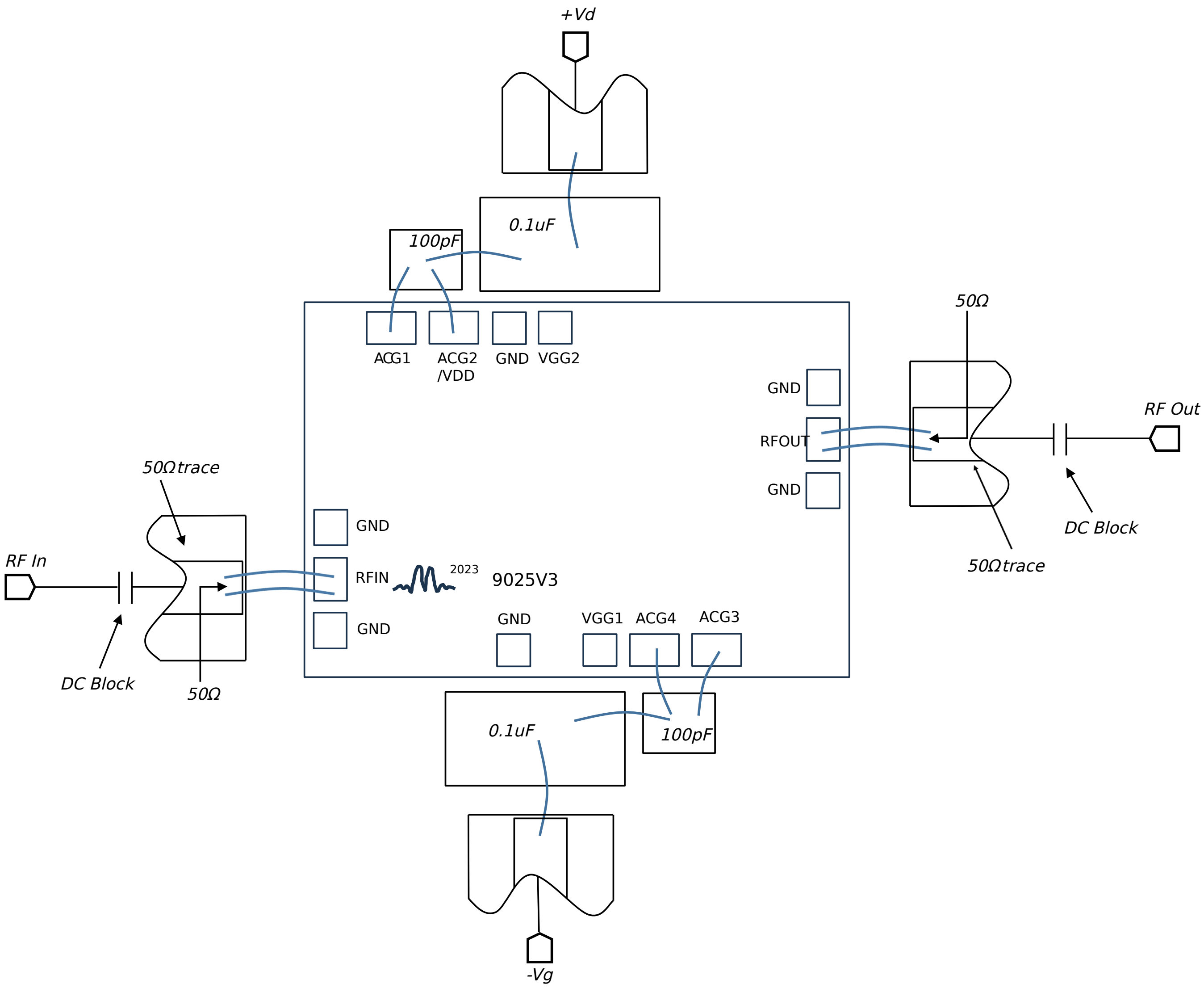








Application Circuit



Application Circuit Description

Above is the recommended application circuit for the AMM-9025CH. Multiple DC power supply bypass capacitors are shown around the die. These capacitors are of the vertical wire-bondable type. DC drain voltage is supplied to the amplifier across 0.1uF and 100pF bypass capacitors to the VDD/AGC2 and ACG1 pads. Internally, the ACG4 pad is connected to the VGG1 pad. To simplify the application circuit, DC gate bias voltage is therefore supplied to the ACG4 and ACG3 pads across 0.1uF and 100pF bypass capacitors. 50 Ohm RF input and output traces should be bonded to the AMM-9025CH using 2 bondwires as shown in the diagram below.The RF input and output ports are DC coupled. Thus,DC blocking capacitors are required at the input and output RF ports of the amplifier. Low frequency performance can be extended by choosing sufficiently large input and output DC blocking capacitors to not impede the RF signal at the frequency of interest.

Note : Type "A" capacitor is a vertical bondable 10 mil sq capacitor from Presidio Components (SA1010B101MGH5C). Type "B" is a parallel plat capacitor custom part built for Marki microwave.

Die Mounting Recommendations

Mounting and Bonding Recommendations

Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This willprevent resonances and permit the best possible electrical performance. Datasheetperformance is only guaranteed in an environment with a low electrical impedance ground.

Mounting - To epoxy the chip, apply a minimum amount of conductive epoxy to themounting surface so that a thin epoxy fillet is observed around the perimeter of the chip.Cure epoxy according to manufacturer instructions.

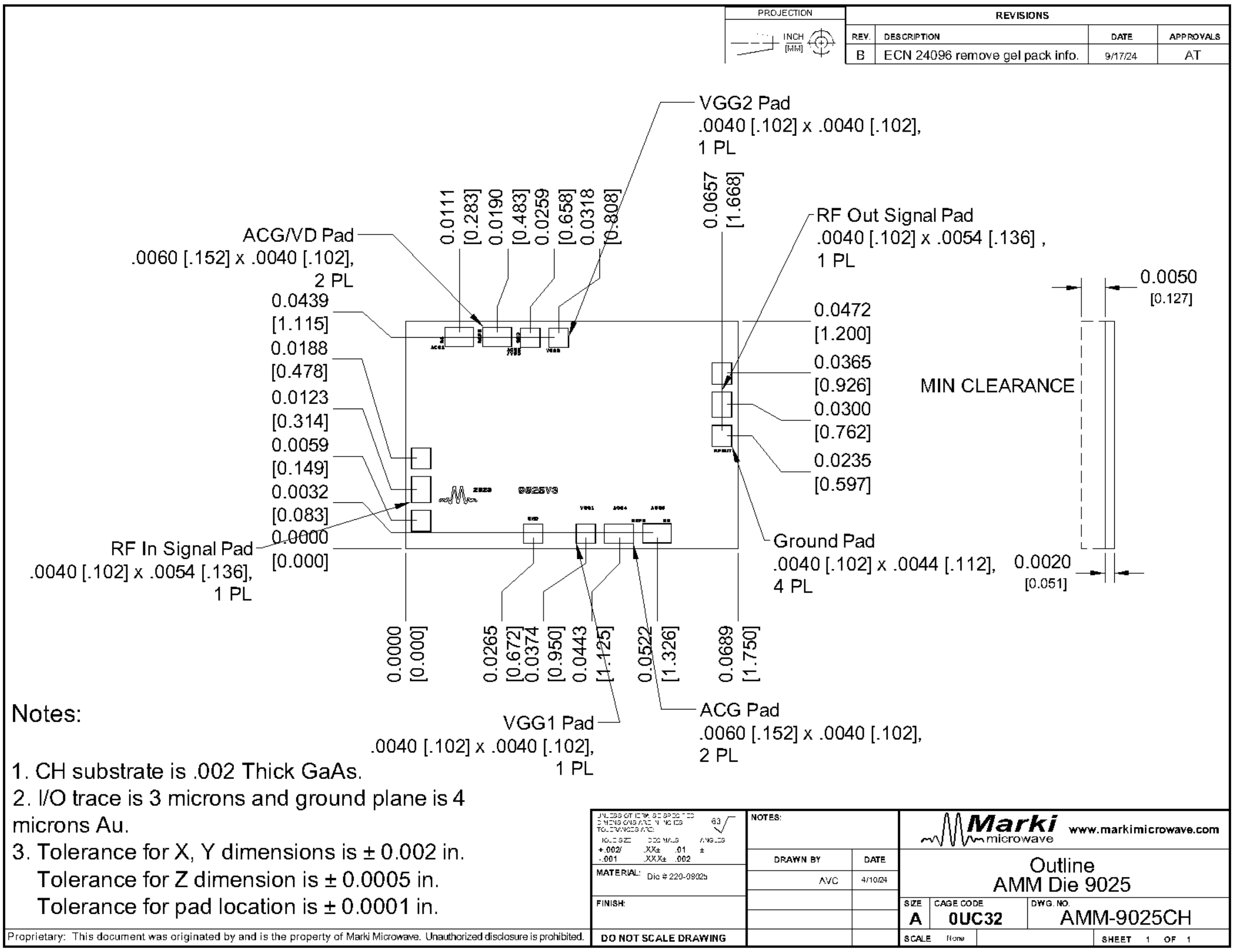
Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire.Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bondingforce of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Usethe minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should bestarted on the chip and terminated on the package or substrate. Bond wire inductancewill improve return loss. Bondwire inductance in the range of 30pH to 200pH will improveperformance.

Circuit Considerations – 50 Ω transmission lines should be used for all high frequencyconnections in and out of the chip. Wirebonds should be kept as short as possible, withmultiple wirebonds recommended for higher frequency connections to reduce parasiticinductance. In circumstances where the chip more than .001” thinner than thesubstrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

Mechanical Data

Outline Drawing

Download : Outline 2D Drawing



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