

BROADBAND DISTRIBUTED AMPLIFIER

ADM-5931CH

The ADM-5931CH is a broadband, power-efficient, moisture-resistant GaAs PHEMT distributed amplifier chip. The ADM-5931CH is designed to provide optimal LO drive for T3 mixers. Typically, it provides 11 dB of gain and +18 dBm saturated output power while requiring only 85 mA of current. T3 linearity is enhanced by ADM-5931's extended high frequency gain and lower even harmonic generation when compared to other distributed amplifiers in our catalog. It can be biased with internal circuitry, or with an external bias network for lower voltage and single supply operation. Additional applications include amplification of clock signals and general-purpose driver requirements in electronic warfare and test and measurement. The enhanced moisture resistance process enables the bare chip to pass biased HAST testing without the use of a hermetically sealed package.



Bare Die

Features

- Low power consumption
- Optimized for use as a [T3 LO buffer amplifier](#)
- 2nd and 4th Harmonic Suppression
- 3rd and 5th Harmonic Generation
- Broadband 50 Ω Matching
- Unconditionally Stable
- Enhanced Moisture Resistance
- Small Signal S-Parameter .s2p files: [ADM-5931CH.s2p](#)

Electrical Specifications - Specifications measured in a 50-Ohm system.

Parameter	Frequency (GHz)	Typical
Input for Saturated Output (dBm)	DC to 28	+8
Output 1 dB Compression (dBm)		+16
Saturated Output Power with negative bias (dBm)		+18
Small Signal Gain with negative bias (dB)		11
Input Return Loss (dB)		16
Output Return Loss (dB)		14
Noise Figure (dB)		6
Third Order Output Intercept Point (dBm)		27
Phase Noise (10 kHz Offset) (dBc/Hz)		-153
Bias Requirements, External (mA)		
Vd: +5.0 to +7.0 / Vg: -0.25 Volts		85
Vd: +5.0 to +7.0 / Vg: 0 Volts		120



Part Number Options

Model Number	Description	Green Status	Product Lifecycle	Export Classification
ADM-5931CH	Chip	RoHS	Active	EAR99
ADM-5931S	TBA			
ADM-0012-5931SM ¹	Surface Mount 3mm QFN			
EVAL3-ADM-5931 ¹	Eval Board			
ADM-0026-5931SM ¹	Surface Mount 4mm QFN			
EVAL4-ADM-5931 ¹	Eval Board			

¹ Note: Datasheets for other package options are available on the Marki Microwave website

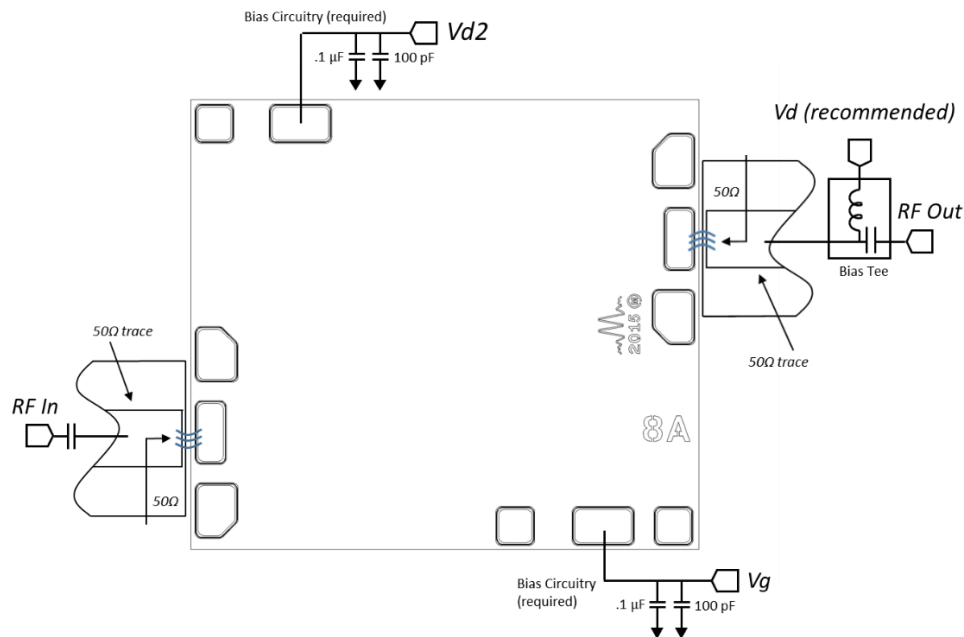
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Frequency DC to 28 GHz

Functional Diagram



Biasing and Operation

RF In / RF Out – Input and output signals should be connected by 50 ohm microstrip or coplanar traces to well matched 50 ohm sources and loads. DC blocking capacitors and bias tees are required.

Vg – Negative gate voltage is optional to improve lifetime of the amplifier and reduce current consumption. Harmonic generation is also significantly affected by the negative gate voltage level. It may be supplied through the Vg pad or through the RF input pad using an external bias tee

Vd – It is recommended that bias voltage Vd is applied through a bias tee on the RF output, but bias supply can also be supplied to Vd through Vd2 pad if desired. This will result in increased operating temperature and slightly reduced gain and power output. Bias supply should be voltage limited below 9 V and current limited below 150 mA at all times. The operational bias voltage should be between 3 V and 7 V for full small-signal gain, or between 5 V and 7 V for full gain, linearity and power output. If bias tee on RF output is used, pad Vd2 voltage should be left unconnected (*not* grounded).

Bias Circuitry – The capacitors on the Vd and Vg lines prevent low frequency oscillation. They may be reduced or omitted in bias circuits with sufficient low-frequency loss. Designers are encouraged to experiment if they want to modify or omit the bias circuitry.

DC/RF Ground – The back of the chip should be connected to a low noise RF and DC ground with very low electrical and thermal resistance for high frequency operation and thermal heat sinking.

Warning: GaAs MMIC devices are susceptible to Electrostatic Discharge. Use proper ESD precautions when handling these items.

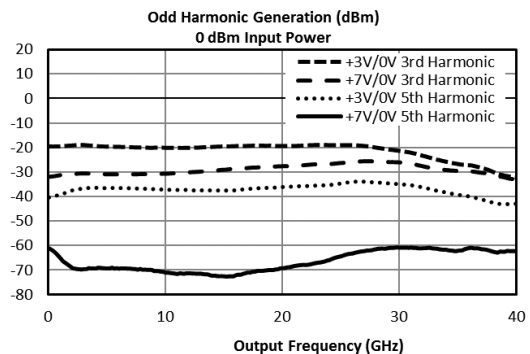
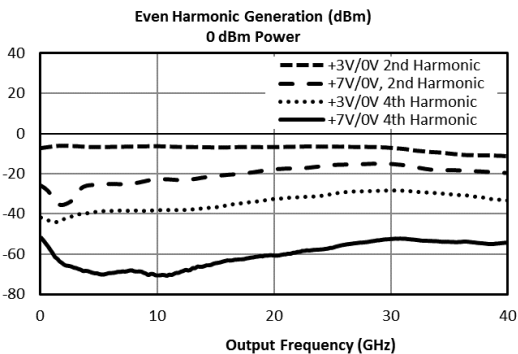
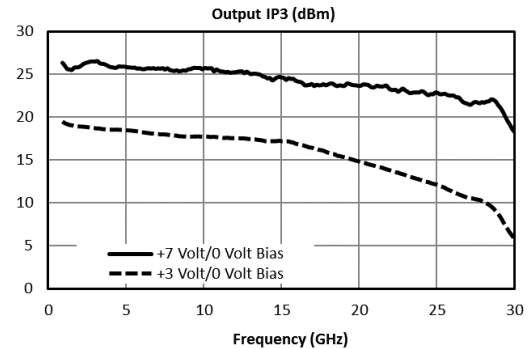
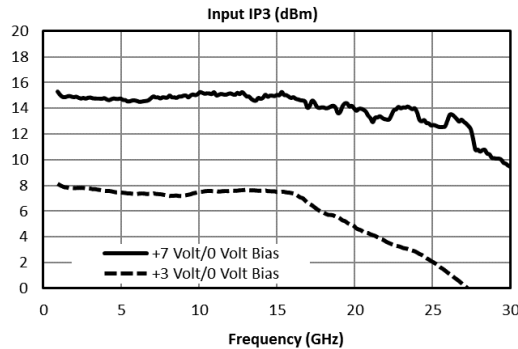
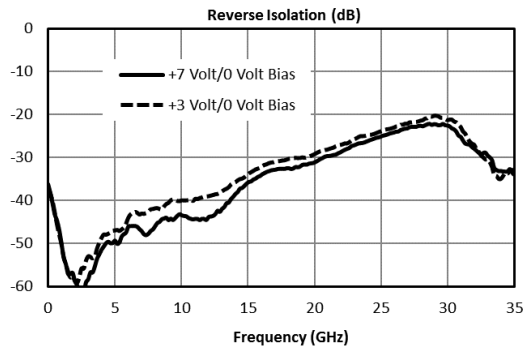
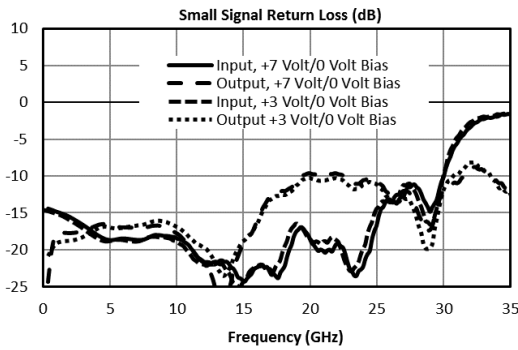
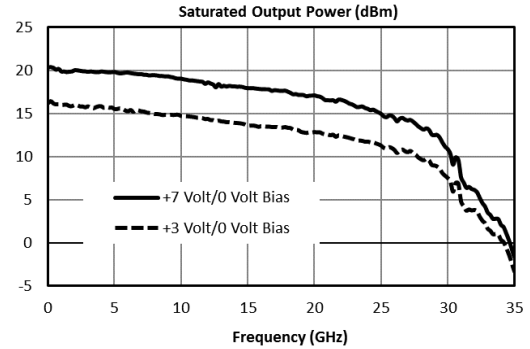
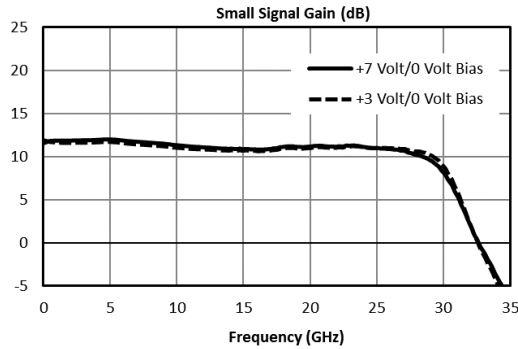
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Frequency DC to 28 GHz

Typical Performance: Positive Only (+3, +7V) Bias (Bias tee on RF output), Grounded Gate (Bias tee on RF input)



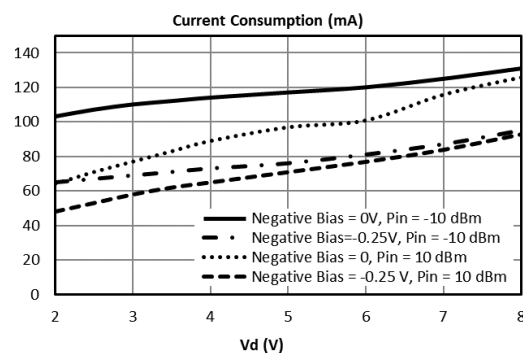
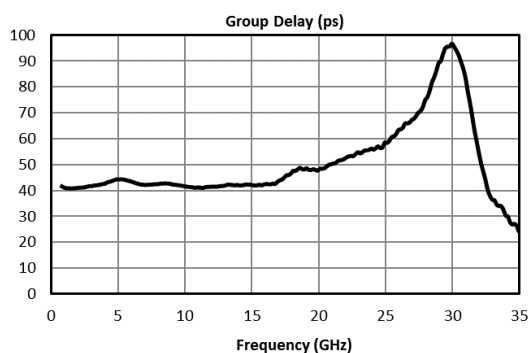
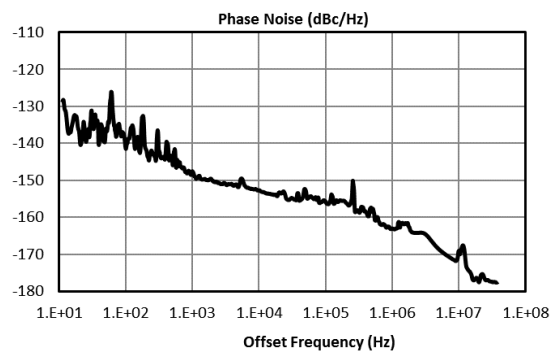
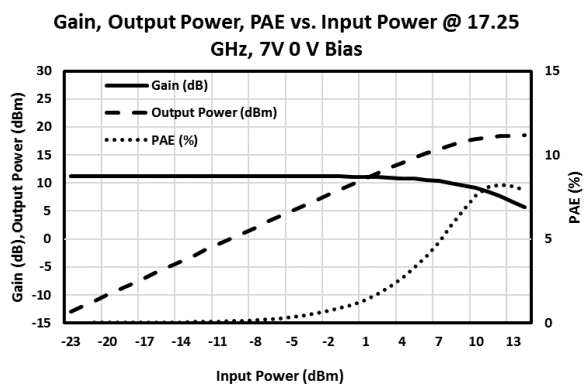
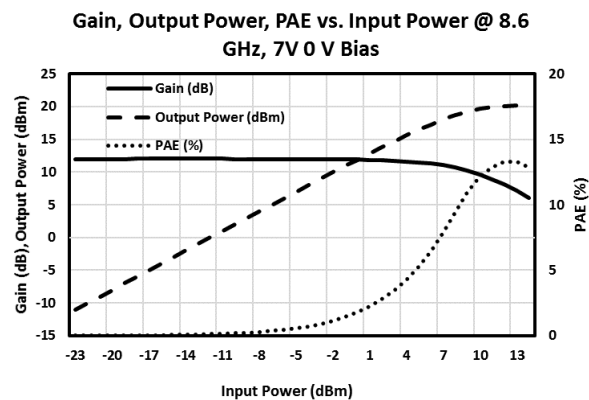
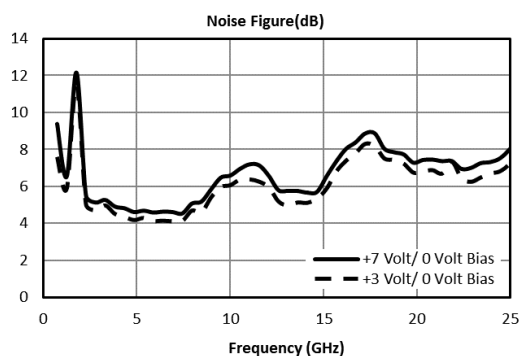
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Frequency DC to 28 GHz

Typical Performance: Positive Only (+3 to +7V) Bias, Grounded Gate (Continued)



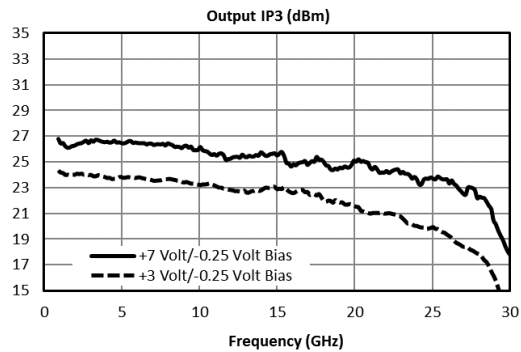
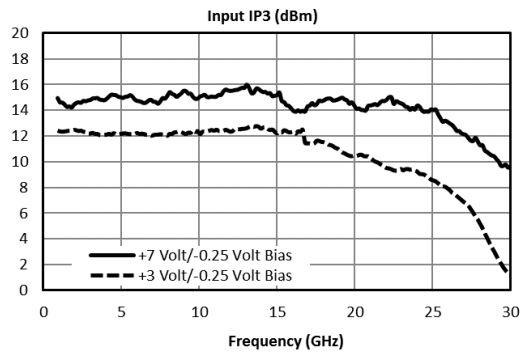
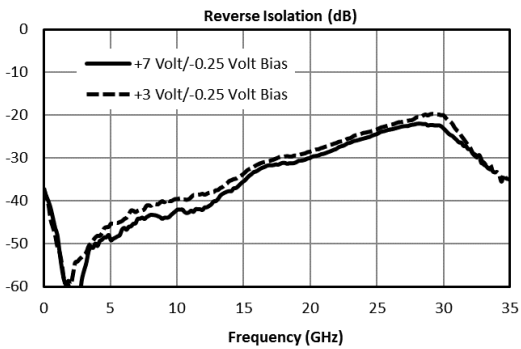
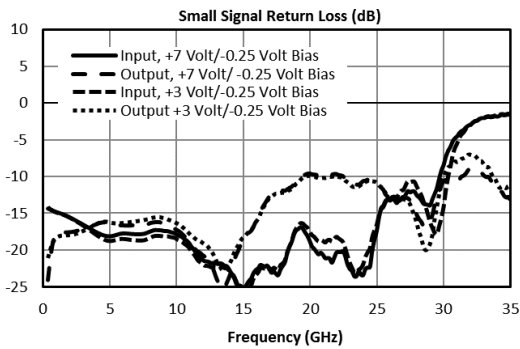
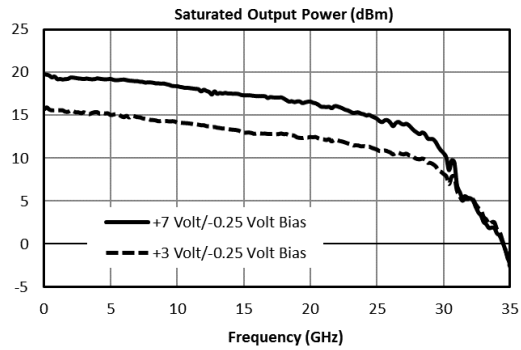
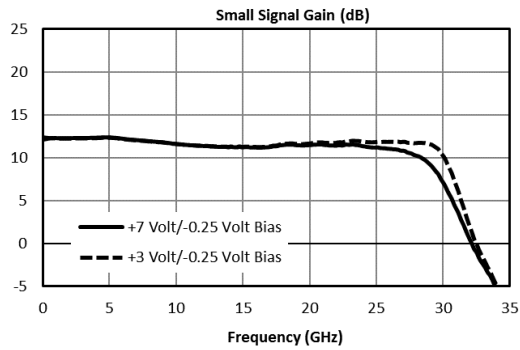
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Frequency DC to 28 GHz

Typical Performance: Positive (+3, +7V) Bias, -0.25 V Negative Bias



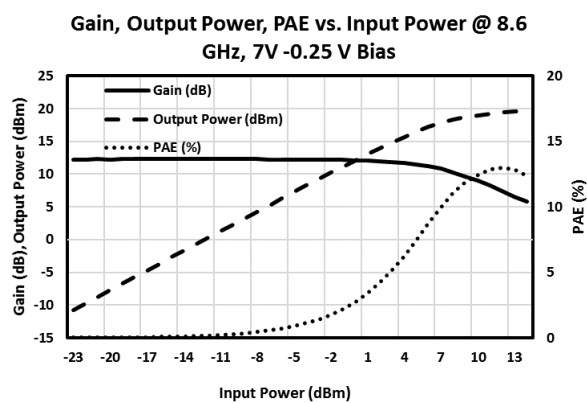
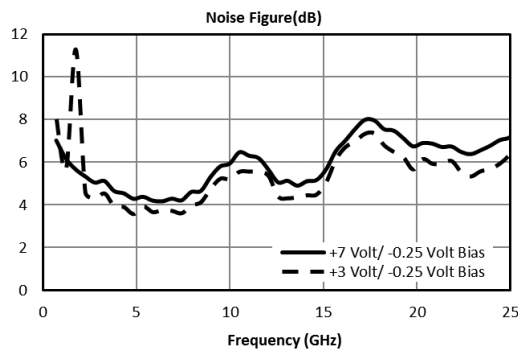
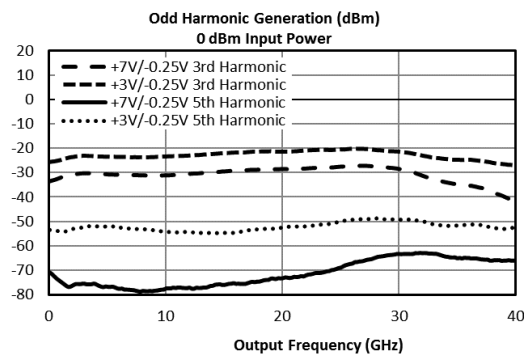
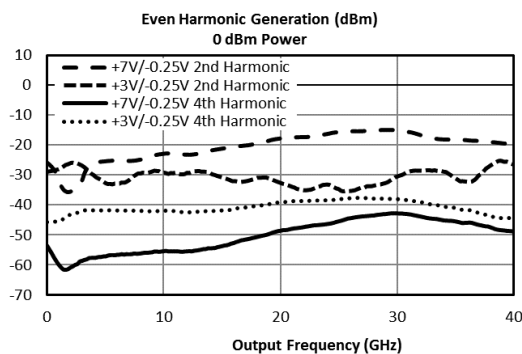
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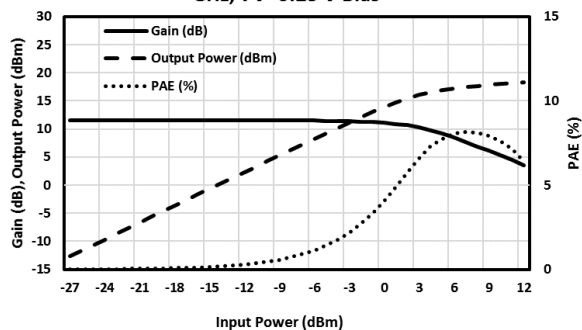
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Frequency DC to 28 GHz

Typical Performance: Positive (+3, +7V) Bias, -0.25 V Negative Bias (Continued)



Gain, Output Power, PAE vs. Input Power @ 17.25 GHz, 7V -0.25 V Bias



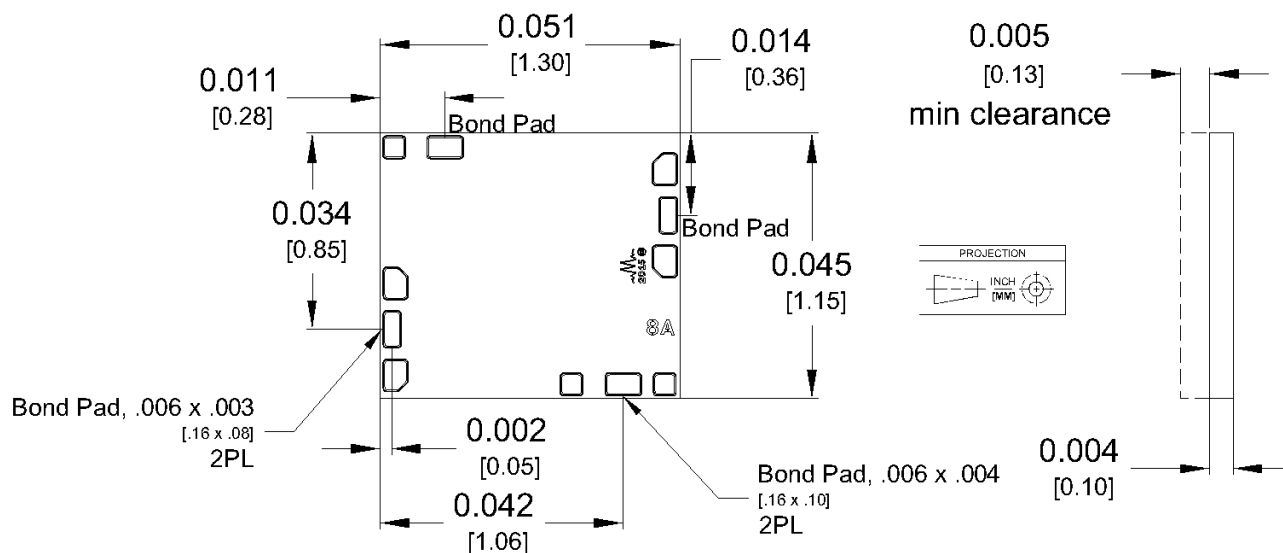
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Chip Outline Drawing

Frequency DC to 28 GHz



1. CH Substrate material is .004 thick GaAs.
2. I/O traces and ground plane finish are 2 microns Au
3. RF GSG probe pitch is 200 μ m
4. All unlabeled pads are ground pads

Port Descriptions		
Function	Description	Interface Schematic
RF in	This pin is DC coupled and matched to 50 Ω .	RF in 
Vg	Gate control for the amplifier. External decoupling capacitors are required.	Vg 
RF out / Vd	This pad is DC coupled and matched to 50 Ω .	 RF out / Vd
Vd2	Optional drain bias port. External decoupling capacitors are required.	 Vd2
GND	Back of chip should be connected to RF/DC ground with low electrical and thermal resistance.	GND 



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Frequency DC to 28 GHz

Absolute Maximum Ratings	
Parameter	Maximum Rating
Positive Bias Voltage	9 V
Positive Bias Current	150 mA
Negative Bias Voltage	-0.3 V
Negative Bias Current	2 mA
RF Input Power	+20 dBm
Power Dissipation	2 W
Thermal Resistance, θ_{jc}	67 C/W
Max Junction Temperature to Maintain 10^6 hours Mean Time to Failure (MTTF):	175°C
ESD (Human Body Model)	Class 0
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C

DATA SHEET NOTES:

1. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.

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Revision History

Revision code	Revision Date	Comment
-	January 2018	Datasheet initial Release
A	July 2019	Thermal Resistance Spec Corrected
B	December 2020	Added Max Junction Temperature Specification

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