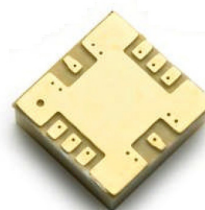


# AMMP-6130

30 GHz Power Amplifier with Frequency Multiplier (x2)  
in SMT Package



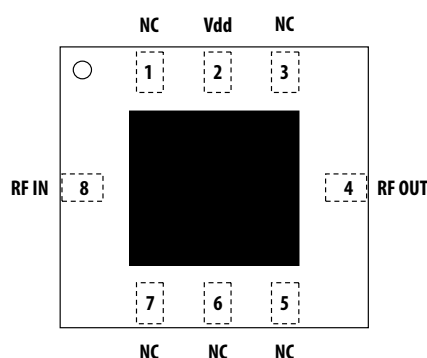
## Data Sheet



### Description

Avago Technologies AMMP-6130 is a high gain, narrow-band doubler and output power amplifier designed for DBS applications and other commercial communication systems. The MMIC takes an input 15 GHz signal and passes it through a harmonic frequency multiplier (x2) and then three stages of power amplification. Integrated matching structures filter and match input/output to 50  $\Omega$ . It has integrated input and output DC blocking capacitors and bias structures to all stages. The MMIC is fabricated using PHEMT technology. The backside of this package part is both RF and DC ground. This helps simplify the assembly process and reduces assembly related performance variations and costs. The surface mount package allows elimination of "chip & wire" assembly for lower cost. This MMIC is a cost effective alternative to hybrid (discrete-FET) amplifiers that require complex tuning and assembly process.

### Package Diagram



### Features

- Surface Mount Package, 5.0 x 5.0 x 1.25 mm
- Integrated DC Block and Choke
- 50  $\Omega$  Input and Output Match
- Single Positive Supply Pin
- No Negative Gate Bias

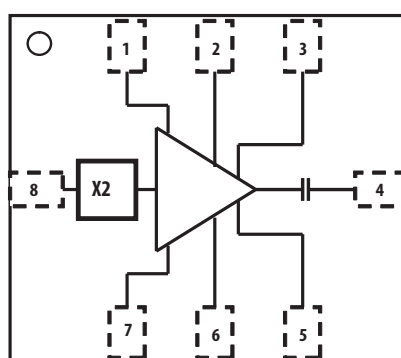
### Specifications (Vd=4.5V, Idd=200mA)

- Frequency Range 15GHz in, 30GHz out
- Output Power: 21 dBm
- Harmonic Suppression: 60dBc
- Single Positive Supply
- DC Requirements: 4.5V, 200mA

### Applications

- Microwave Radio systems
- Satellite VSAT, DBS Up/Down Link
- Broadband Wireless Access)

### Functional Block Diagram



Pin	Function
1	
2	V <sub>d</sub>
3	
4	RF <sub>Out</sub>
5	
6	
7	
8	RF <sub>In</sub>

PACKAGE  
BASE  
GND



**Attention: Observe precautions for handling electrostatic sensitive devices.**  
ESD Machine Model = 80V  
ESD Human Body Model = 250V  
Refer to Avago Application Note A004R:  
*Electrostatic Discharge, Damage and Control.*

Note: MSL Rating = Level 2A

## Electrical Specifications

1. Small/Large -signal data measured in a fully de-embedded test fixture form  $T_A = 25^{\circ}\text{C}$ .
2. Pre-assembly into package performance verified 100% on-wafer per AMMC-6220 published specifications.
3. This final package part performance is verified by a functional test correlated to actual performance at one or more frequencies.
4. Specifications are derived from measurements in a  $50\ \Omega$  test environment. Aspects of the amplifier performance may be improved over a more narrow bandwidth by application of additional conjugate, linearity, or low noise ( $\Gamma_{\text{opt}}$ ) matching.
5. All tested parameters guaranteed with measurement accuracy  $\pm 1\text{ dB/dBm/dBc}$

**Table 1. RF Electrical Characteristics**

Parameter	Min	Typ.	Max	Unit	Comment
Conversion Gain, Gain	14	16	18.5	dB	
Operational Frequency, Freq		30		GHz	
Output Power, Pout	18.5	21	21.5	dBm	Tested at 29.25 and 30 GHz
Fundamental Suppression, FS		60		dBc	
3rd Harmonic Suppression, 3H Sup		50		dBc	

**Table 2. Recommended Operating Range**

1. Ambient operational temperature  $T_A = 25^{\circ}\text{C}$  unless otherwise noted.
2. Channel-to-backside Thermal Resistance ( $T_{\text{channel}}(T_c) = 34^{\circ}\text{C}$ ) as measured using infrared microscopy. Thermal Resistance at backside temperature ( $T_b = 25^{\circ}\text{C}$ ) calculated from measured data.

Description	Min.	Typical	Max.	Unit	Comments
Drain Supply Current, Id		200	250	mA	$V_d = 4.5\text{ V}$ , Under any RF power drive and temperature
Drain Supply Voltage, Vd	3.5	4.5	5	V	

**Table 3. Thermal Properties**

Parameter	Test Conditions	Value
Thermal Resistance, $\theta_{jc}$	Channel-to-backside Thermal Resistance $T_{\text{channel}}(T_c) = 34^{\circ}\text{C}$ Thermal Resistance at backside temperature $T_b = 25^{\circ}\text{C}$	$\theta_{jc} = 27^{\circ}\text{C/W}$

## Absolute Minimum and Maximum Ratings

**Table 4. Minimum and Maximum Ratings**

Description	Pin	Min.	Max.	Unit	Comments
Drain to Ground Supply Voltage	Vdd		5	V	
Drain Current	Idd		300	mA	
RF CW Input Power	Pin		15	dBm	CW
Channel Temperature			+150	$^{\circ}\text{C}$	
Storage Temperature		-65	+150	$^{\circ}\text{C}$	
Maximum Assembly Temperature			+260	$^{\circ}\text{C}$	20 second maximum

Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to this device.

## AMMP-6130 Typical Performance

(TA = 25°C, Vdd=4.5V, Idd=200 mA, Zin = Zout = 50Ω, Pin=3dBm unless otherwise stated)

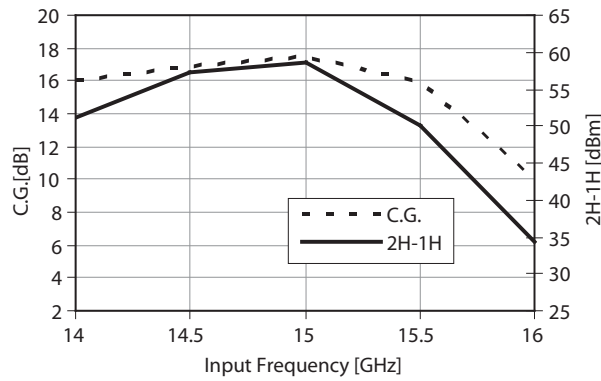


Figure 1. Conversion Gain & Fundamental Sup vs. Input Freq

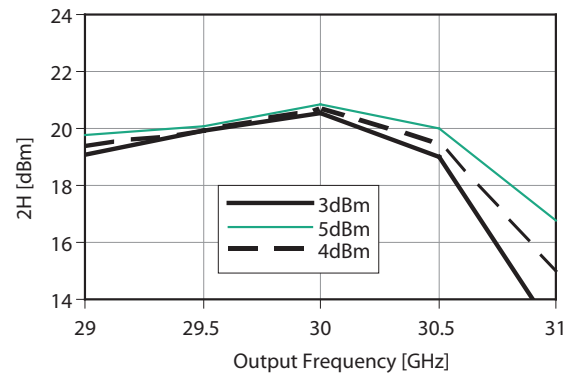


Figure 2. Output Power vs. Output Frequency vs. Input Power

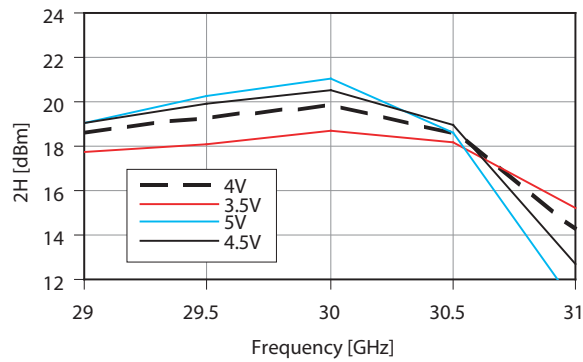


Figure 3. Output Power vs. Output Frequency @ 4 bias levels

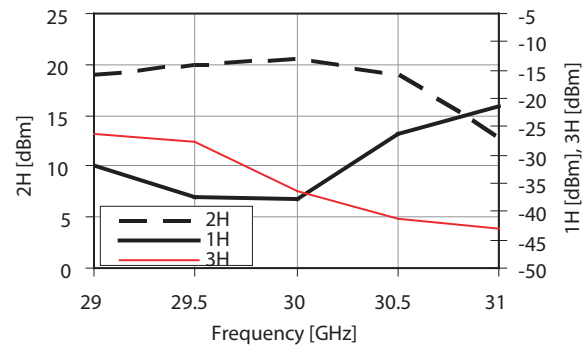


Figure 4. Fundamental, 2H & 3H Output Power vs. Output Freq

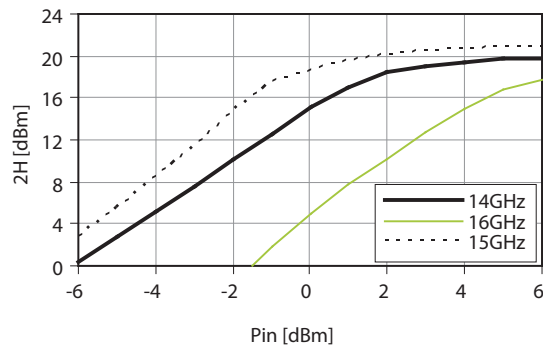


Figure 5. Output Power vs. Input Power vs. Input Freq

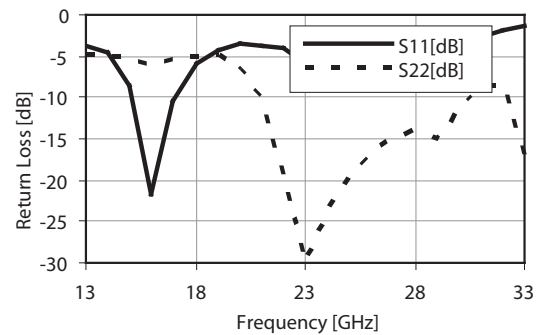


Figure 6. Input and Output Return Loss vs. Freq

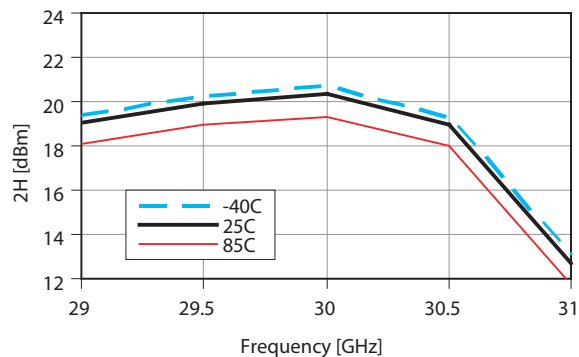


Figure 7. Output Power vs. Output Freq @ Temp = 25C, -40C & 85C

## Biasing and Operation

The AMMP-6130 frequency doubler has been designed with a fully integrated self bias network; thus, requiring only a single 4.5v bias input with a typical current draw of 200mA.

The one-stage frequency doubler relies on the non-linear behavior of the FET to produce the doubled signal at the output. A high-pass filter at the input shorts any reflected 2nd harmonic signal to ground. The input also consists of matching components tuned to 15GHz. An additional LC-filter is included at the input for stability. The doubler is operated at pinch-off to create a half-wave conduction angle ideal for generation of the 2nd harmonic. The AMMP-6130 is also designed for stability over temperature.

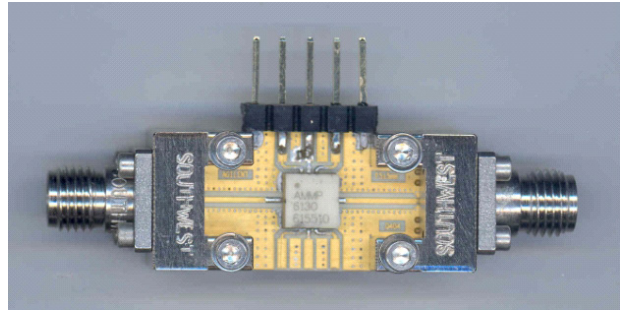


Figure 8. Evaluation / Test Board (Available to qualified customer requests)

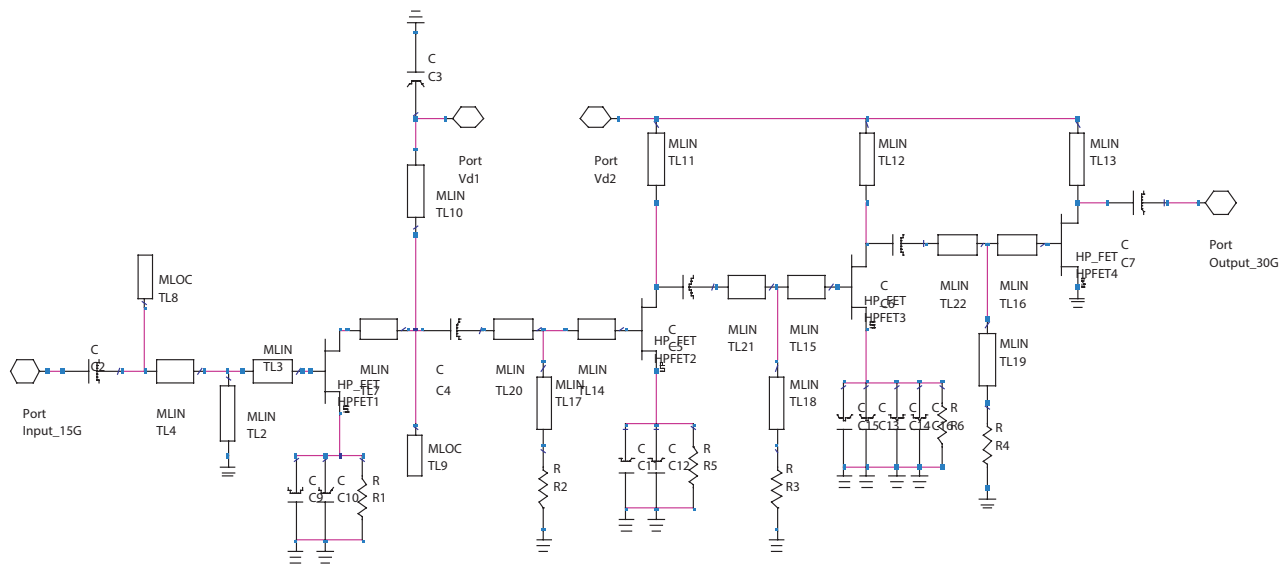


Figure 9. Simplified Doubler-Amplifier Schematic

## Typical Scattering Parameters

Please refer to <<http://www.avagotech.com>> for typical scattering parameters data.

## Package Dimension, PCB Layout and Tape and Reel information

Please refer to Avago Technologies Application Note 5520, AMxP-xxxx production Assembly Process (Land Pattern A).

## AMMP-6130 Part Number Ordering Information

Part Number	Devices Per Container	Container
AMMP-6130-BLKG	10	Antistatic bag
AMMP-6130-TR1G	100	"7" Reel
AMMP-6130-TR2G	500	"7" Reel

For product information and a complete list of distributors, please go to our web site: [www.avagotech.com](http://www.avagotech.com)

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