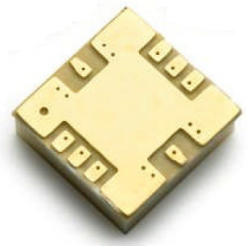
AMMP-6331

18-GHz to 31-GHz 0.2W Driver Amplifier in SMT Package

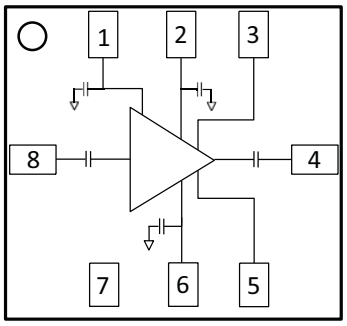
Data Sheet



Description

The AMMP-6331 is a broadband 0.2W driver amplifier designed for use in transmitters operating in various frequency bands from 18 GHz to 31 GHz. This small, easy-to-use device provides over 23 dBm of output power (P_{-1dB}) and more than 20 dB of gain at 25 GHz. It was optimized for linear operation with an output power at the third order intercept point (OIP3) of 30 dBm. The AMMP-6331 features a temperature-compensated RF power detection circuit that enables power detection sensitivity of 0.3 V/W at 25 GHz. It is fabricated using the Broadcom unique 0.25-µm E-mode PHEMT technology that eliminates the need for negative gate biasing voltage.

Functional Block Diagram



Pin	Function	Pin	Function
1	Vf	5	DET_R
2	Vd	6	Vd
3	DET_O	7	NC
4	RF_out	8	RF_in

RoHS-Exemption

Note: Refer to Toxic and Hazardous Substances.

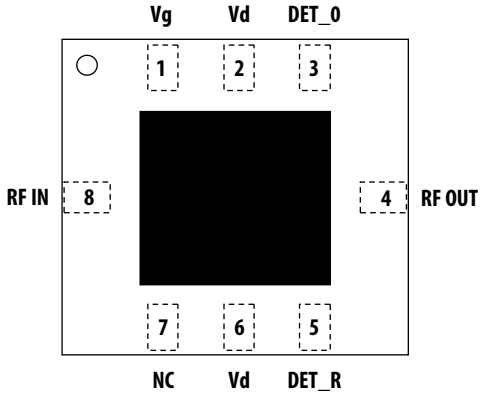
Features

- Frequency range: 18 GHz to 31 GHz
- Small signal gain: 20 dB
- P_{-1dB}: 23 dBm
- Return Loss (In/Out): –10 dB

Applications

- Microwave radio systems
- VSAT

Package Diagram



Attention: Observe precautions for handling electrostatic sensitive devices.
ESD Machine Model (Class A) = 90V
ESD Human Body Model (Class 1A) = 300V
Refer to Application Note *A004R: Electrostatic Discharge, Damage and Control*.

Note: MSL Rating = Level 2A.

Electrical Specifications

- All data measured on a 2.4-mm connector based evaluation board (Rogers 4350B) at Vd = 5V, Idq = 230 mA, Tc = 25 °C, and 50Ω at all ports.
- All tested parameters guaranteed with measurement accuracy ±2 dB for P_{-1dB} of 17 GHz, 25 GHz, and 31 GHz, ±0.5 dB for Gain of 17 GHz, ±1 dB for Gain of 25 GHz and 31 GHz.

Table 1 RF Electrical Characteristics

Parameter	Performance									Unit
	17 GHz to 20 GHz			20 GHz to 30 GHz			30 GHz to 31 GHz			
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Small Signal Gain, G	14	16	—	19	22	—	18	20.5	—	dB
Output power at 1-dB Gain Compression, P_{-1dB}	18	20.5	—	22	24.5	—	21	24	—	dBm
Output power at 3-dB Gain Compression, P_{-3dB}	—	21.5	—	—	24.5	—	—	23.5	—	dBm
Third Order Intercept, OIP3	—	30	—	—	30	—	—	30	—	dBm
Input Return Loss, RLin	—	10	—	—	10	—	—	8	—	dB
Output Return Loss, RLout	—	10	—	—	14	—	—	10	—	dB
Reverse Isolation	—	45	—	—	45	—	—	45	—	dB

Table 2 Recommended Operating Range

Description	Pin	Specifications			Unit	Comments
		Min	Typ	Max		
Drain Supply Voltage	Vd	—	5	—	V	
Gate Supply Voltage	Vg	—	1.67	—	V	
Gate Supply Current, Ig		—	7	—	mA	
Drain Supply Current, Id		—	230	—	mA	(Vd = 5 V, Vg set for typical Idq – quiescent current)
Frequency Range		18	—	31	GHz	

Table 3 Thermal Properties

Parameter	Test Conditions	Value
Thermal Resistance, θ_{ch-b}	—	θ_{ch-b} = 27 °C/W
Channel Temperature ($T_{channel}$)	Vd = 5V, Id = 230 mA, Pd = 1.15W Tbaseplate = 85°C	$T_{channel}$ = 116°C
Channel Temperature ($T_{channel}$) Under RF Drive	Vd = 5V, Id = 400 mA, Pout = 24 dBm Pd = 2W, Tbaseplate = 85°C	$T_{channel}$ = 139°C

Absolute Minimum and Maximum Ratings

Table 4 Minimum and Maximum Ratings[a, b]

Description	Pin	Specifications		Unit	Comments
		Min	Max		
Drain Supply Voltage	Vd	—	5.5	V	
Gate Supply Voltage	Vg	0	2.5	V	
RF Input Power (Pin)	RFIN	—	20	dBm	CW
Power Dissipation (Pd)		—	2.5	W	Pd = Vd x Id + Pin – Pout
Channel Temperature		—	+150	°C	
Storage Temperature		–65	+150	°C	

a. Operation in excess of any one of these conditions may result in permanent damage to this device. Functional operation at or near these limitations will significantly reduce the lifetime of the device.

b. When operated at maximum Pd with a base plate temperature of 85°C, the median time to failure (MTTF) is significantly reduced.

Selected Performance Plots

All data measured on a 2.4-mm connector based evaluation board at Vd = 5V, Idq = 230 mA, Ta = 25°C, and 50Ω at all ports.

Figure 1 Gain and Reverse Isolation vs Frequency

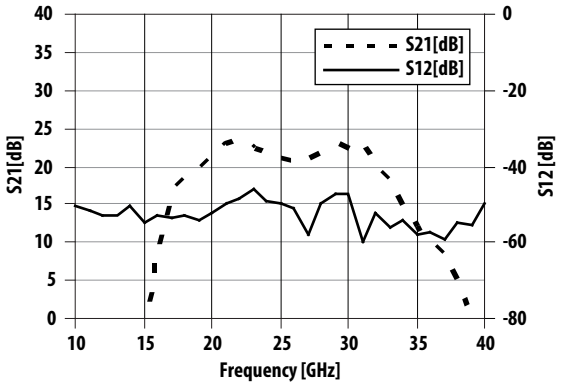


Figure 2 Return Loss vs Frequency

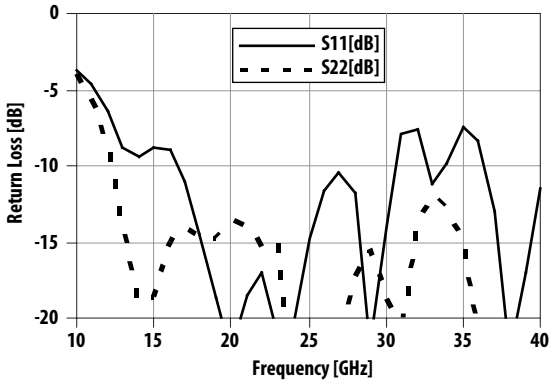


Figure 3 P_{-1dB} and PAE vs Frequency

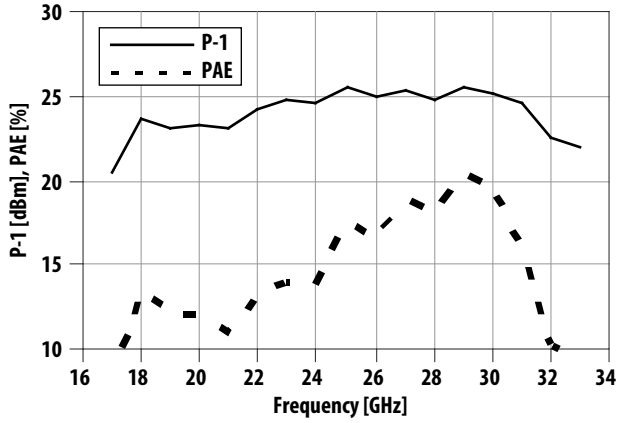


Figure 4 Typical IMD3 vs Frequency (SCL = Single Carrier Level)

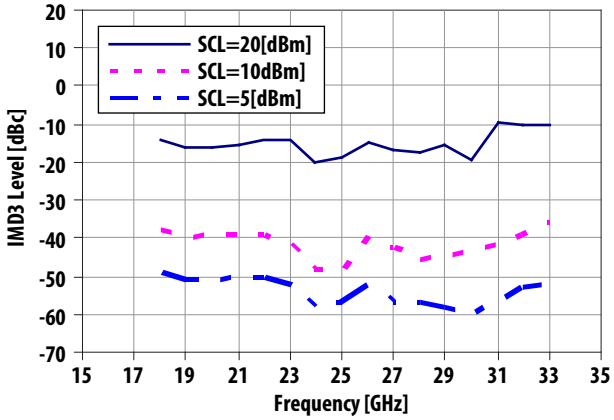


Figure 5 Typical Noise Figure vs Frequency

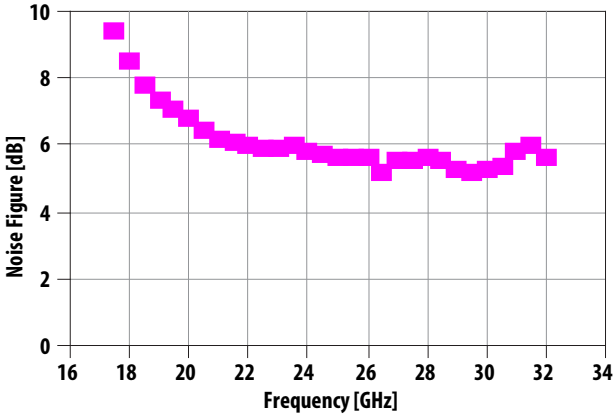
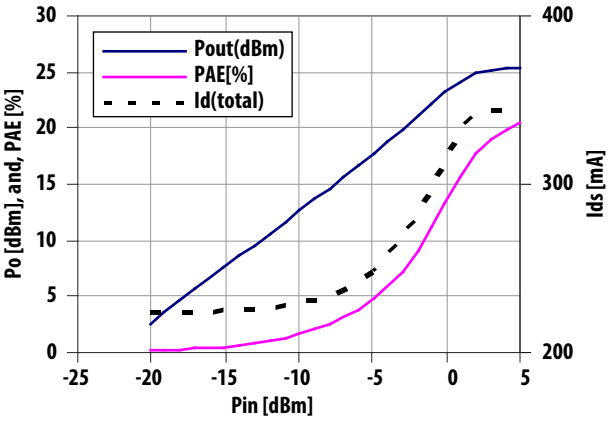


Figure 6 Output Power, PAE, and Drain Current vs Input Power at 30 GHz



Over Temperature Performance Plots

All data measured on a 2.4-mm connector based evaluation board at Vd = 5V, Idq = 230 mA, and 50Ω at all ports. Id has been maintained at 230 mA under different temperature conditions.

Figure 7 |S11| vs Frequency and Temperature

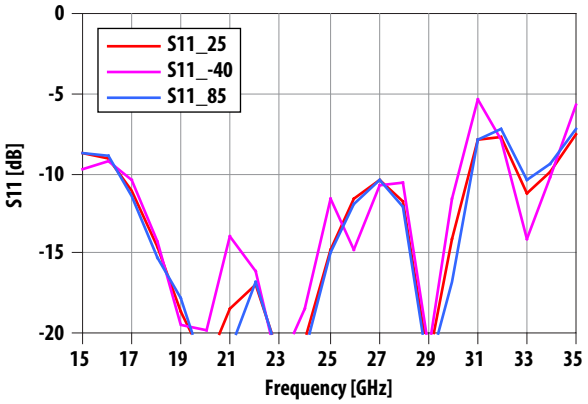


Figure 8 |S22| vs Frequency and Temperature

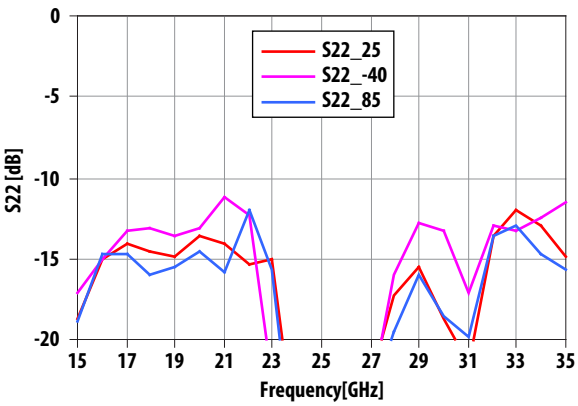


Figure 9 |S21| vs Frequency and Temperature

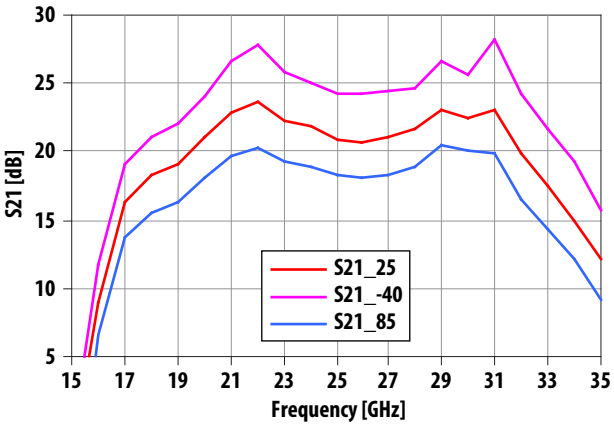
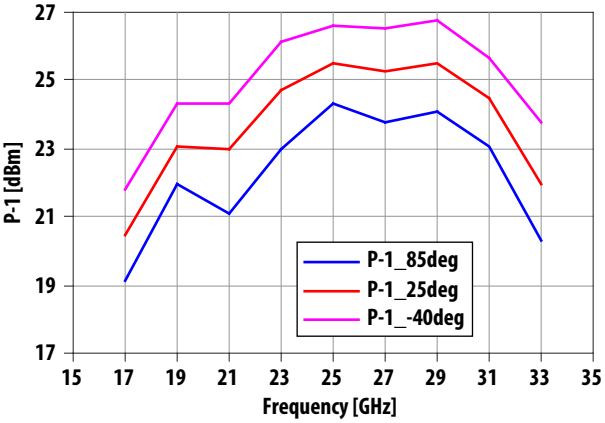


Figure 10 P_{-1dB} vs Frequency and Temperature



Over Voltage Plots

All data measured on a 2.4-mm connector based evaluation board at Ta = 25°C, and 50Ω at all ports.

Figure 11 P_{-1dB} vs Frequency and Vds (I_{dQ} = 230 mA)

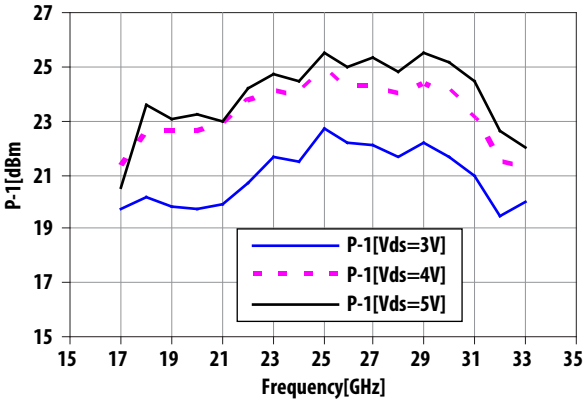


Figure 12 Small Signal Gain vs Frequency and I_{dQ} (Vds = 5V)

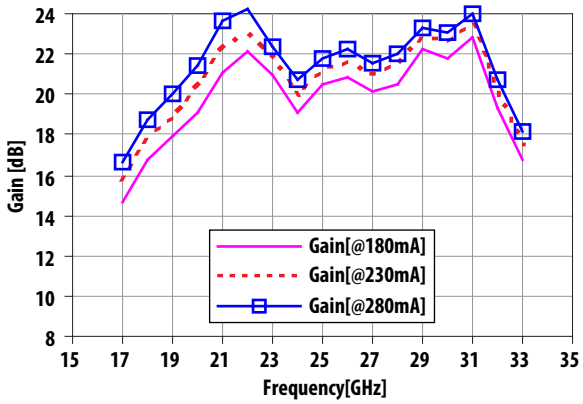


Figure 13 Small Signal Gain vs Frequency and Vds (I_{dQ} = 230 mA)

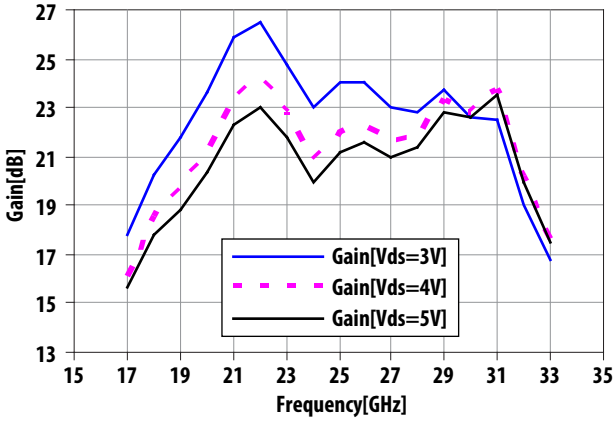
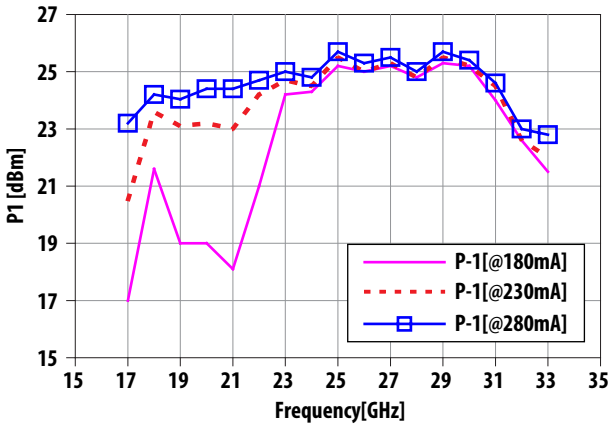


Figure 14 P_{-1dB} vs Frequency and I_{dQ} (Vds = 5V)



Typical Scattering Parameters

Refer to www.broadcom.com for typical scattering parameters data.

Application Circuit

AMMP-6331 Biasing Circuits

Both sides of the part must be biased. Either Pin 2 or Pin 6 can be used for Vdt.

Figure 15 Dual Positive DC Power Supply

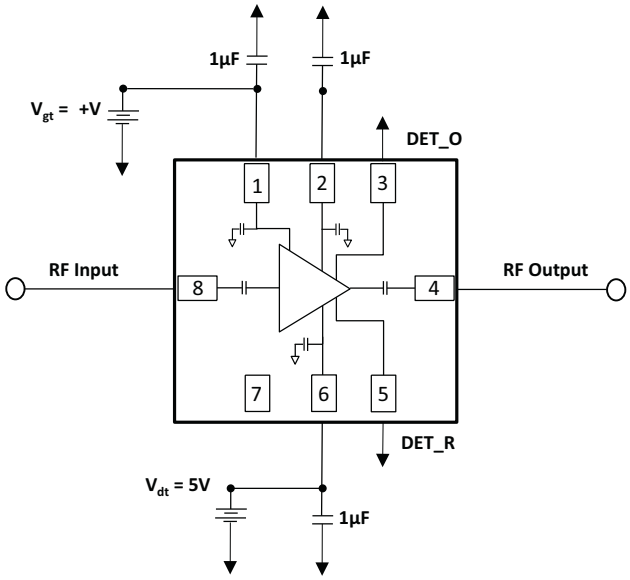
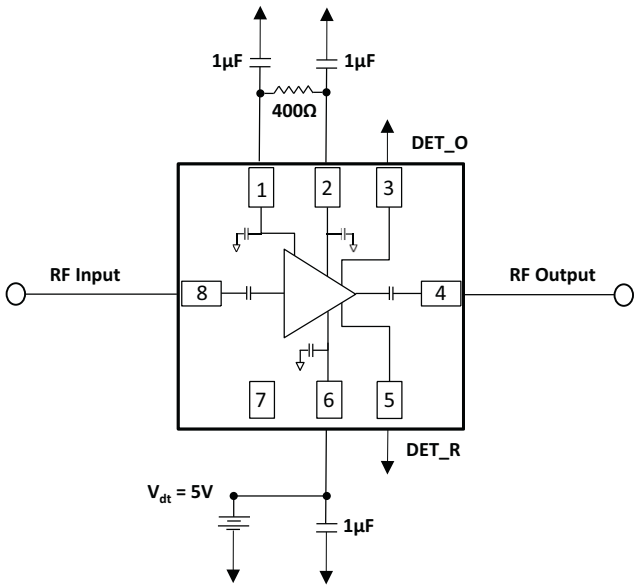


Figure 16 Single Positive DC Power Supply



Package Dimension, PCB Layout and Tape and Reel Information

Refer to Application Note 5520, *AMxP-xxxx Production Assembly Process (Land Pattern A)*.

Ordering Information

Part Number	Devices Per Container	Container
AMMP-6331-BLKG	10	Antistatic bag
AMMP-6331-TR1G	100	7″ Reel
AMMP-6331-TR2G	500	7″ Reel

Toxic and Hazardous Substances

Names and Contents of the Toxic and Hazardous Substances or Elements in the Products
产品中有毒有害物质或元素的名称及含量

Part Name 部件名称	Toxic and Hazardous Substances or Elements 有毒有害物质或元素					
	Lead (Pb) 铅 (Pb)	Mercury (Hg) 汞 （Hg ）	Cadmium (Cd) 镉 （Cd ）	Hexavalent (Cr(VI)) 六价铬（Cr(VI) ）	Polybrominated biphenyl (PBB) 多溴联苯（PBB ）	Polybrominated diphenylether (PBDE) 多溴二苯醚（PBDE ）
100pF capacitor	×	O	O	O	O	O

O: indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006.
×: indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ/T 11363-2006.
(The enterprise may further explain the technical reasons for the “x” indicated portion in the table in accordance with the actual situations.)

O：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下。
×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求。
（企业可在此处，根据实际情况对上表中打“×” 的技术原因进行进一步说明。）

Note: EU RoHS compliant under exemption clause of “lead in electronic ceramic parts (e.g. piezoelectronic devices)”

For product information and a complete list of distributors, please go to our web site: www.broadcom.com.

AV02-1457EN – March 20, 2017