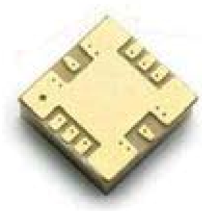
AMGP-6432

28-31 GHz 2W SMT Packaged Power Amplifier

AVAGO TECHNOLOGIES

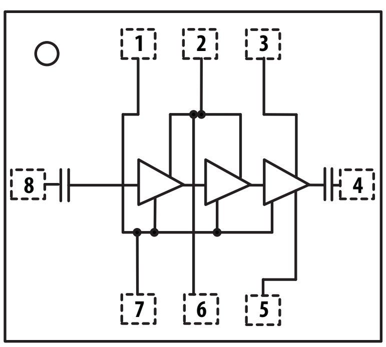
Data Sheet



Description

The AMGP-6432 is a surface mount packaged 2-Watt power amplifier that operates from frequencies between 28 to 31 GHz. In the operational frequency band from 29.25 to 30 GHz, it provides 33 dBm of typical output power (P_{1dB})/ 34 dBm P_{sat} and 21.5dB of small-signal gain. This PA is also suitable for high linear application where the PA demonstrates greater than than -38dBc of third order output inter modulation (OIM3) at +18dBm/ tone output power level.

Functional Block Diagram



Pin	Function
1	Vg
2	Vd1
3	Vd2
4	RF_OUT
5	Vd2
6	Vd1
7	Vg
8	RF_IN

Attention: Observe Precautions for handling electrostatic sensitive devices.
ESD Machine Model (Class A): 60 V
ESD Human Body Model (Class 1A): 200 V
Refer to Avago Application Note A004R: Electrostatic Discharge Damage and Control.

Features

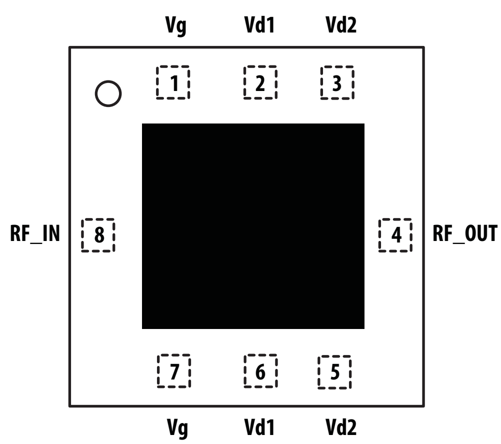
- 5 x 5 mm surface mount package
- > +33 dBm Output Power from 28.5 to 31 GHz
- 50 Ω input and output match
- -40° C to +85° C operation

Applications

- VSAT
- Microwave Radio System
- Satellite Up/Down Link

Export License Control: ECCN 3A001.b.2.c

Package Diagram



ELECTRICAL SPECIFICATIONS

Table 1. Absolute Minimum and Maximum [1] Ratings

Parameter		Specifications			Comments
Description	Pin	Min.	Max.	Unit	
Drain Supply Voltage	V_{d1} V_{d2}		6.5	V	
Gate Supply Voltage	V_g	-2	0	V	
RF Input Power (P_{in}) [2]	RFIN		24	dBm	CW
Power Dissipation (P_{diss})			10	W	$P_{diss} = V_{d1} \times I_{d1} + V_{d2} \times I_{d2} + P_{in} - P_{out}$
MSL			MSL2		
T_{CH}			150	°C	Channel Temperature
T_{STG}		-65	150	°C	Storage Temperature

Notes:
1. Operation of this device above any one of these maximum parameters may cause permanent damage
2. With the DC (typical bias) and RF applied to the device at board temperature T_b= 25° C

Table 2. Recommended Operating Range

Parameter			Specifications				
Description		Pin	Min.	Typical	Max.	Unit	Comments
Drain Supply Voltage		V_{d1} V_{d2}		6.0		V	
Gate Supply Voltage		V_g	-0.1	-0.83	-0.6	V	
Maximum Gate Current		$I_{g,\ max}$	-3	-2.5		mA	$I_{g,\ max}$ occurs at highest RF P_{out} condition.
Quiescent Drain Supply Current (I_{dq})		V_{d1} V_{d2}		300 400		mA	$I_{dq} = I_{d1} + I_{d2}$
RF Output Power (P_{out})		RFOUT		33		dBm	CW
Frequency Range			28		31	GHz	
Thermal Resistance, θ_{ch-b}				7.6		°C/W	Channel to board
Base Plate Temperature			-40		+85	°C	
ESD	Human Body Model			200		V	
	Machine Model			60		V	

Electrical Specifications

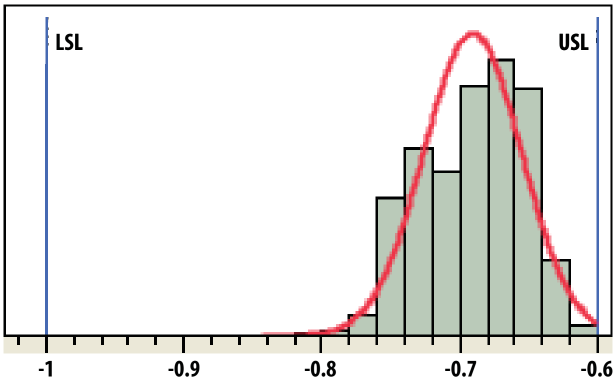
All data measured on a 2.4 mm connectorized production contactor board (Rogers 4350B) at $V_{dd1} = V_{dd2} = 6$ V, $I_{dq} = 0.7$ A ($I_{dq1} + I_{dq2}$), Tc = 25° C, and 50 Ω at all ports unless otherwise stated

Table 3. RF Electrical Characteristics

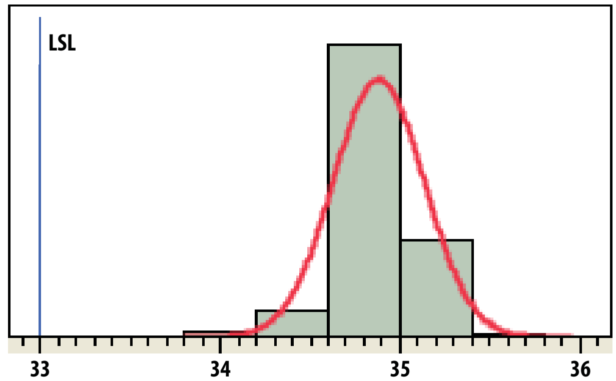
Parameter		Performance				
		Min.	Typical	Max.	Unit	Comments
Frequency Range (GHz)		28		31	GHz	
Input Return Loss (dB)			-15		dB	Small Signal
Output Return Loss (dB)			-12		dB	Small Signal
Gain (dB) [1] @ Freq = 29.25 GHz (P_{in} = 0 dBm) @ Freq = 30 GHz		18 18	21.5 21.3	25 25	dB	V_{dd} = 6 V, I_{dq} = 0.7 A V_{dd} = 6 V, I_{dq} = 0.7 A
Reverse Isolation (dB)			-50		dB	Small Signal
P_{out} [1] (P_{in} = 17 dBm)	@ Freq = 29.25 GHz @ Freq = 30 GHz	33 33	34.8 34.3		dBm	V_{dd} = 6V , I_{dq} = 0.7 A V_{dd} = 6 V, I_{dq} = 0.7 A
P_{1dB} [2]	@ Freq = 29.25 GHz @ Freq = 30 GHz	32 32	33.9 32.9			V_{dd} = 6 V, I_{dq} = 0.7 A V_{dd} = 6 V, I_{dq} = 0.7 A
IM3 Level			-38		dBc	Δf = 20 MHz, P_{out} = 20 dBm/tone
Total Drain Current			0.7		A	I_{dq}

Note:
1. Pout & Gain measurement accuracy is subjected to the tolerance of ±0.5 dBm respectively.
2. Guaranteed by design

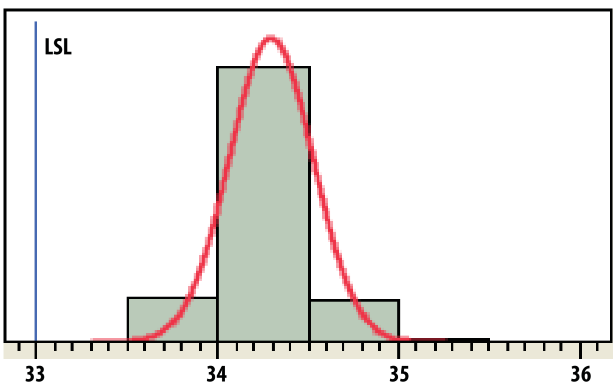
Product Consistency Distribution Charts at 29.25 GHz and 30 GHz, $V_{dd} = 6$ V, $I_{dd} = 0.7$ A



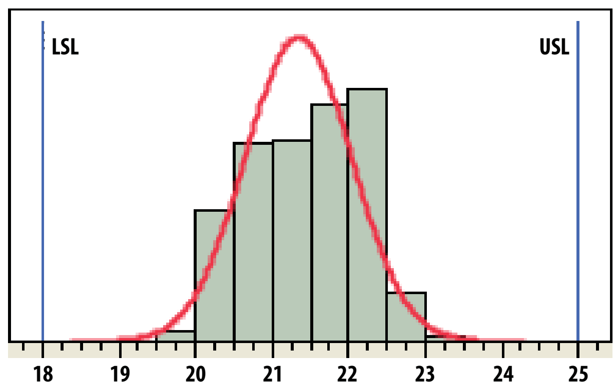
V_g @ $V_{dd} = 6$ V, $I_{dq} = 0.7$ A, Mean = -0.68 V, LSL = -1 V, USL = -0.6 V



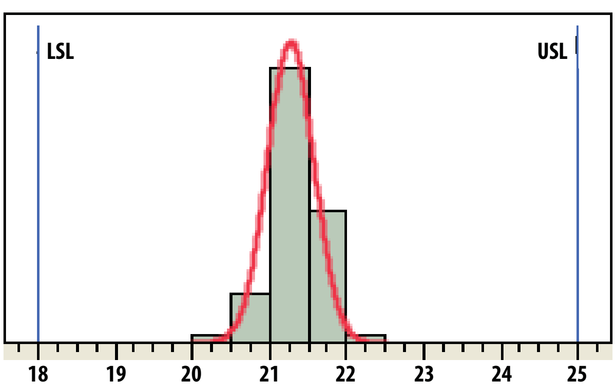
P_{out} @ 29.25 GHz (P_{in} = 17 dBm), Mean = 34.8 dBm, LSL = 33 dBm



P_{out} @ 30 GHz (P_{in} = 17 dBm), Mean = 34.3 dBm, LSL = 33 dBm



Gain @ 29.25 GHz, Mean = 21.5 dB, LSL = 18 dB, USL = 25 dB



Gain @ 30 GHz, Mean = 21.2 dB, LSL = 18 dB, USL = 25 dB

Selected Performance Plots

All data measured on a 2.4 mm connector based evaluation board at $V_{dd1} = V_{dd2} = 6$ V, $I_{dq} = 0.7$ A ($I_{d1} + I_{d2}$), $T_A = 25°$ C, and 50 Ω at all ports.

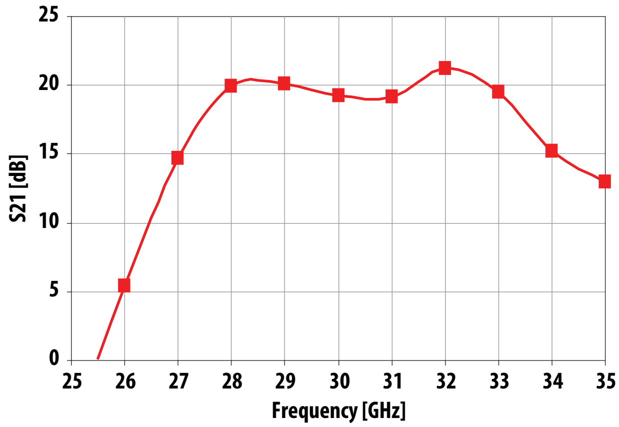


Figure 1. S_{21} (dB) Frequency Sweep

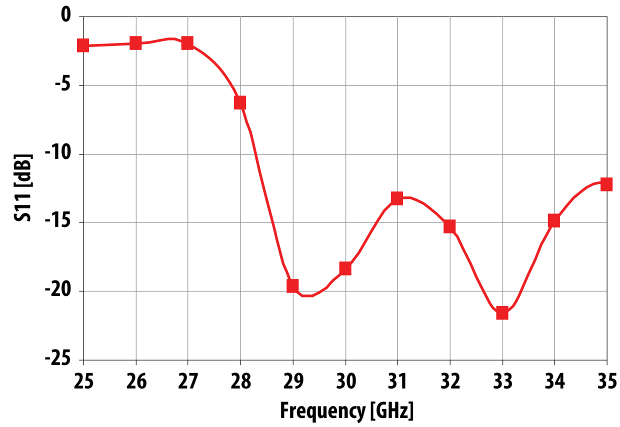


Figure 2. S_{11} (dB) Frequency Sweep

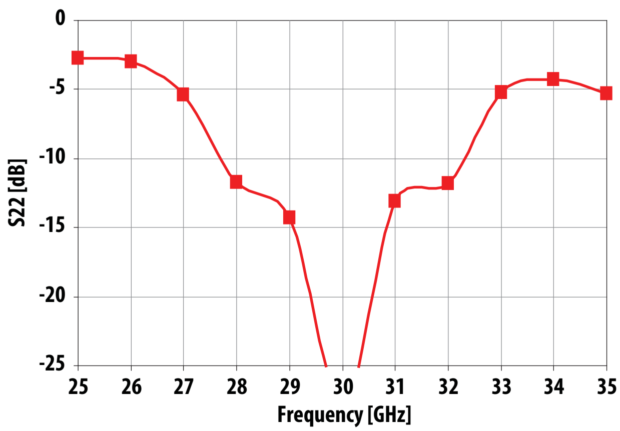


Figure 3. S_{22} (dB) Frequency Sweep

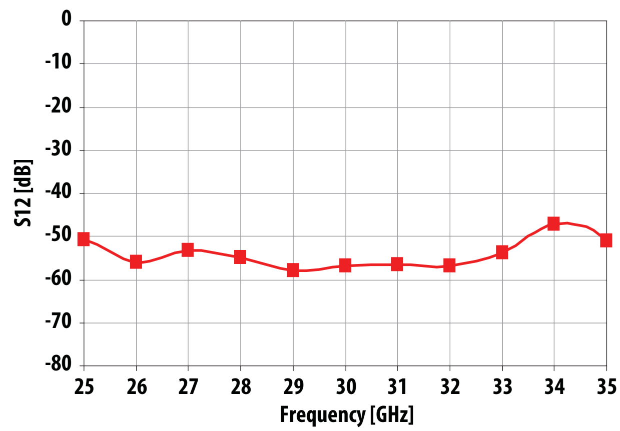


Figure 4. S_{12} (dB) Frequency Sweep

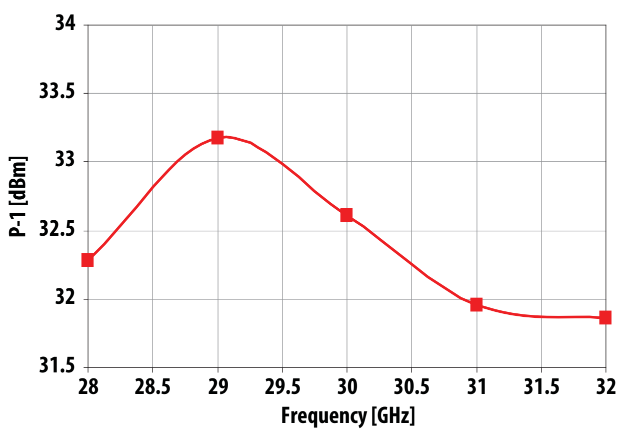


Figure 5. P_{1dB} (dBm) Frequency Sweep

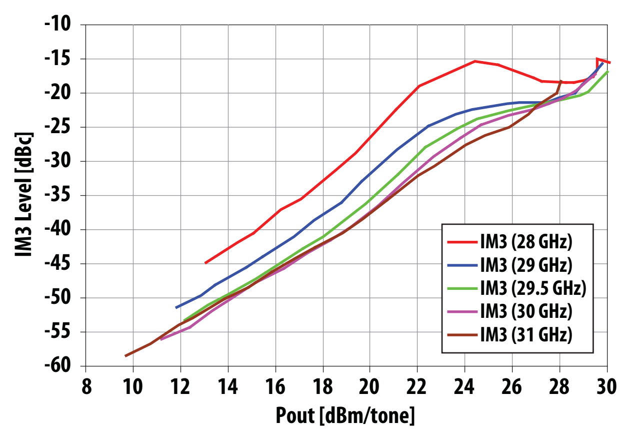


Figure 6. IM3 level (dBc) vs. Output power/tone

Selected Performance Plots over Operating Temperature Range

All data measured on a 2.4 mm connector based evaluation board at $V_{dd1} = V_{dd2} = 6$ V, $I_{dq} = 0.7$ A ($I_{d1} + I_{d2}$), and 50 Ω at all ports. Idg has been maintained at 0.7 A under different temperature conditions. Plotted data shown this page includes evaluation board loss and connector loss approximately 0.5 dB/one side.

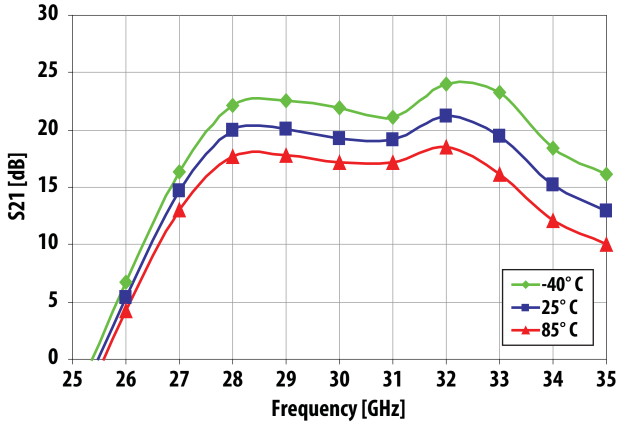


Figure 7. S_{21} (dB) Frequency Sweep over Temperature

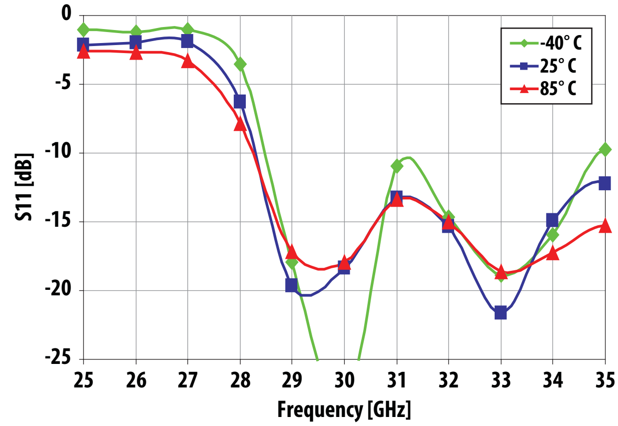


Figure 8. S_{11} (dB) Frequency Sweep over Temperature

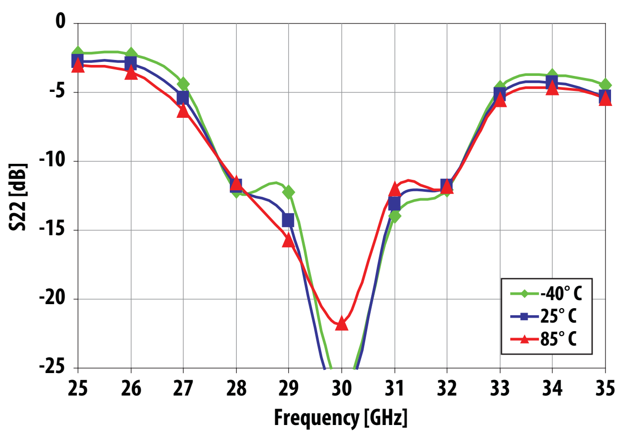


Figure 9. S_{22} (dB) Frequency Sweep over Temperature

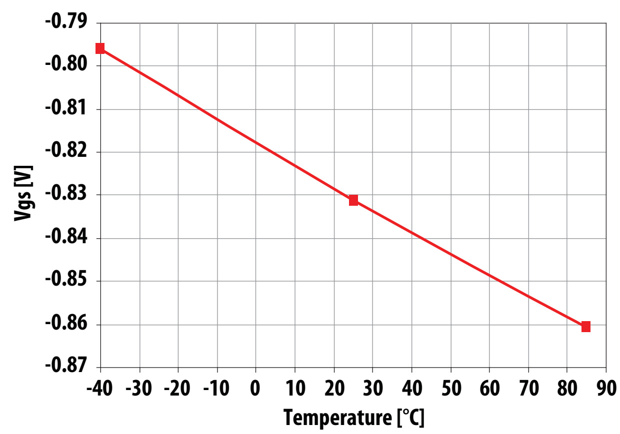


Figure 10. Typical V_{gs} for $I_{dq} = 0.7$ A over Temperature

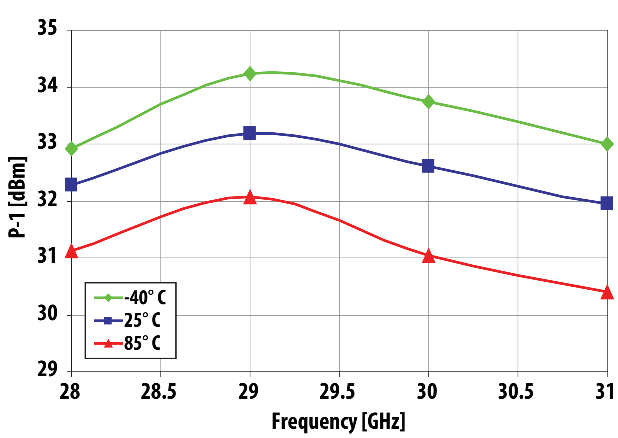


Figure 11. P_{1dB} (dBm) Frequency Sweep over Temperature

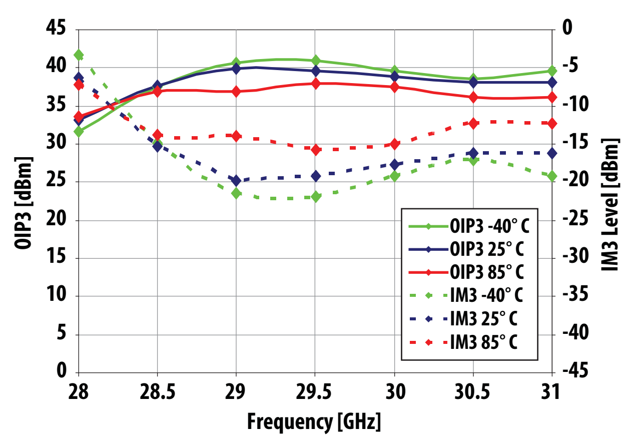


Figure 12. OIP3(dBm) and IM3 level (dBm) Frequency Sweep over Temperature @ Po = 20 dBm/tone

Selected Performance Plots Over Operating Supply Voltage Range

All data measured on a 2.4 mm connector based evaluation board at T_A = 25° C, and 50 Ω at all ports. Plotted data shown this page includes evaluation board loss and connector loss approximately 0.5 dB/one side.

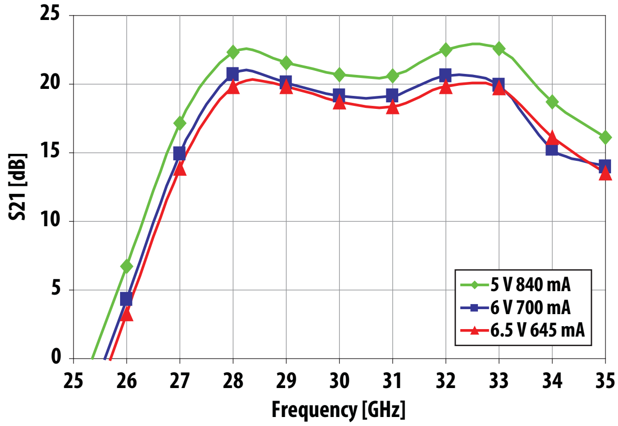


Figure 13. S_{21} (dB) Frequency Sweep

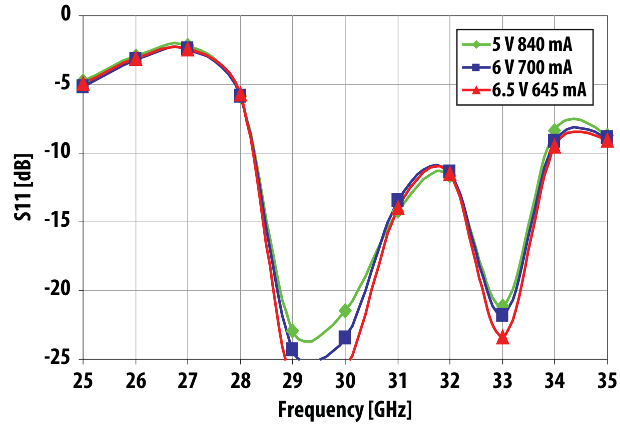


Figure 14. S_{11} (dB) Frequency Sweep

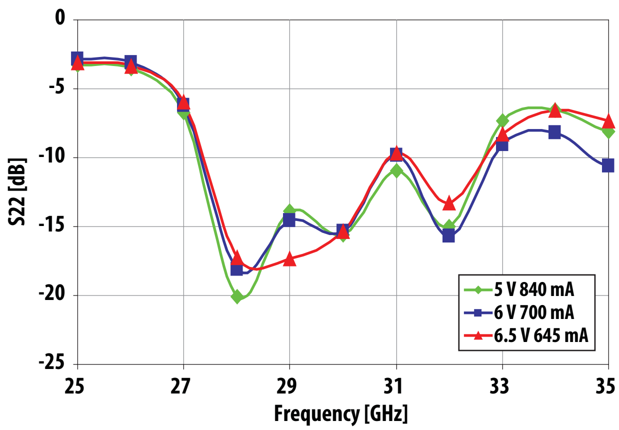


Figure 15. S_{22} (dB) Frequency Sweep

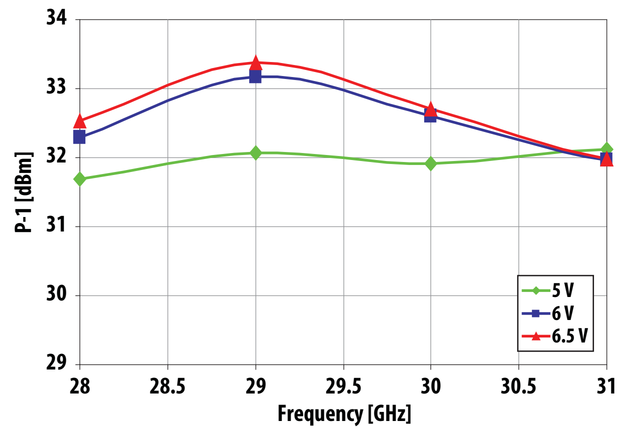


Figure 16. P_{1dB} (dBm) Frequency Sweep

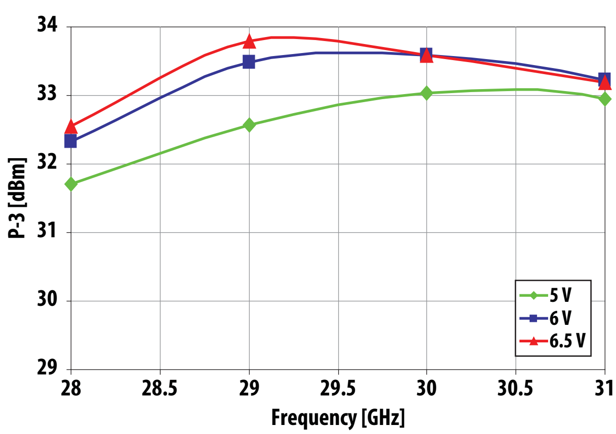


Figure 17. P_{3dB} (dBm) Frequency Sweep

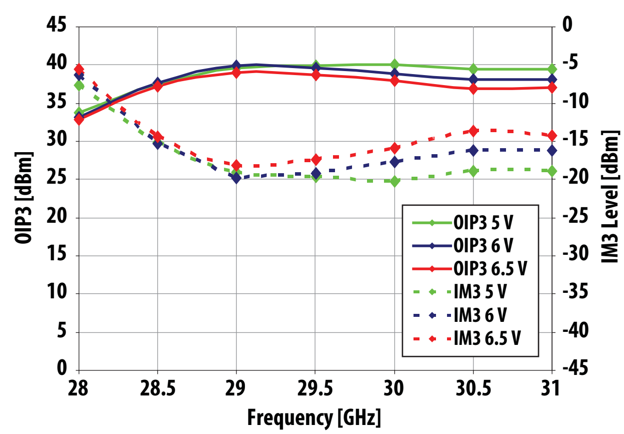


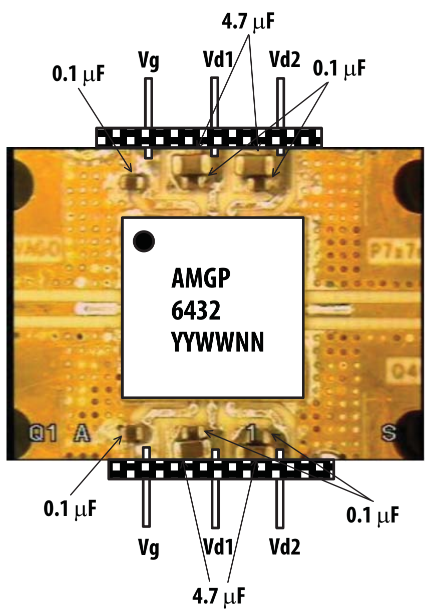
Figure 18. OIP3 and IM3 level vs. Frequency Sweep @ Po = 20 dVm/tone

Reliability Data

Please contact Avago Technical and/or Customer supports for more detail www.avagotech.com

Evaluation Board Description

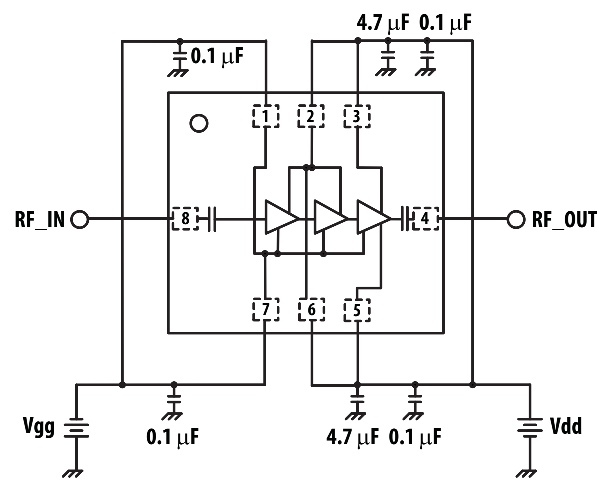
Demo-board Pins



Notes:
1. Vd1 and Vd2 must be biased from both sides.
2. Vg can be biased from either side.

Figure 19. Demo Unit

Application Circuit



Notes:
1. Vg pins can be biased from either side.
2. Vd pins must be biased from both sides.

Figure 20. Application Circuit

Table 4. Typical Test Conditions:

PIN		
$V_{d1,2}$	6 V	Drain Supply Voltage
$I_{dq} = I_{d1} + I_{d2}$	0.7 A	Quiescent Drain Current
V_g	-0.83 V	Gate Supply Voltage

Notes: Vg of -0.83 V may need be adjusted to obtain I_{dq} = 0.7 A.

Recommended turn on sequence

- Apply V_g at -1.5 V
- Apply V_{d1} and V_{d2} at 0 V
- Increase V_d to 6 V
- Increase V_g of -1.5 V to approximately -0.83 V to obtain I_{dq} = 0.7 A
- Apply RF Input not to exceed 20 dBm
- Turn off in reverse order

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).

Part Number Ordering Information

Part Number	Devices per Container	Container
AMGP-6432-BLKG	10	antistatic bag
AMGP-6432-TR1G	100	7″ Reel
AMGP-6432-TR2G	500	7″ Reel

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

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