VG101

Cellular-band Variable Gain Amplifier

The Communications Edge ™

Product Information

Product Features

- 750 – 1000 MHz bandwidth
- 30 dB Attenuation Range
- +40 dBm Output IP3
- +21 dBm P1dB
- Constant IP3 & P1dB over attenuation range
- Single voltage supply
- 6x6 mm 28-pin QFN package
- MTTF > 100 years

Applications

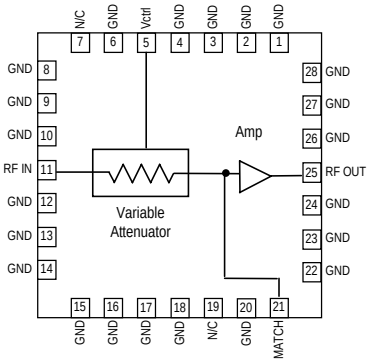
- Xmit & Rcv AGC circuitry for mobile infrastructure

Product Description

The VG101 is a cellular-band high dynamic range variable gain amplifier (VGA) packaged in a 6x6 mm surface-mount package. The +21 dBm output compression point and +40 dBm output intercept point of the amplifier are maintained over the entire attenuation range, making the VG101 ideal for use in transmitter and receiver AGC circuits and as a variable gain stage following an LNA in high dynamic range receiver front ends.

Superior thermal design allows the product to have a minimum MTTF rating of 100 years at a mounting temperature of +85º C. All devices are 100% RF & DC tested and packaged on tape and reel for automated surface-mount assembly.

Functional Diagram



Function	Pin No
Gain Control	5
No Connect	7, 19
RF Input	11
Interstage Match	21
RF Output / DC bias	25
Ground	All other pins Backside copper

Specifications

Parameter	Units	Min	Typ	Max	Conditions
Frequency Range	MHz	750	900	1000	See note 1
Gain at min. attenuation	dB	15	16		
Input Return Loss	dB		10		
Output Return Loss	dB		10		
Output P1dB	dBm		+21		
Output IP3	dBm	+37	+40		See note 2
Noise Figure at min. attenuation	dB		3.8		V_{CTRL} = 0 V
Gain Variation Range	dB		30		See note 3
Gain Variation Control Voltage, V_{CTRL}	V	0		4.5	
Group Delay	ns		1		Frequency = 800 MHz
Supply Voltage	V		+5		
Operating Amplifier Current Range	mA	120	150	180	Pin 25
Gain Control Pin Current Range	mA	0		25	Pin 5 draws no current at maximum gain
Thermal Resistance	°C / W			59	
Junction Temperature	°C			160	See note 4

Test conditions unless otherwise noted.
1. T = 25ºC, Vdd = +5 V, Frequency = 900 MHz in an application circuit.
2. 3OIP measured with two tones at an output power of +10 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate the 3OIP using a 2:1 rule.
3. The gain variation range is measured with 15 mA of current on gain control pin 5.
4. The junction temperature ensures a minimum MTBF rating of 1 million hours of usage.

Absolute Maximum Rating

Parameter	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-55 to +125 °C
Amplifier Supply Voltage (pin 25)	+6 V
Attenuation Control Voltage	+5.5 V
RF Input Power (continuous)	+12 dBm
Junction Temperature	+220° C

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

Part No.	Description
VG101	Cellular-band Variable Gain Amplifier
VG101-PCB	Fully Assembled Application Board

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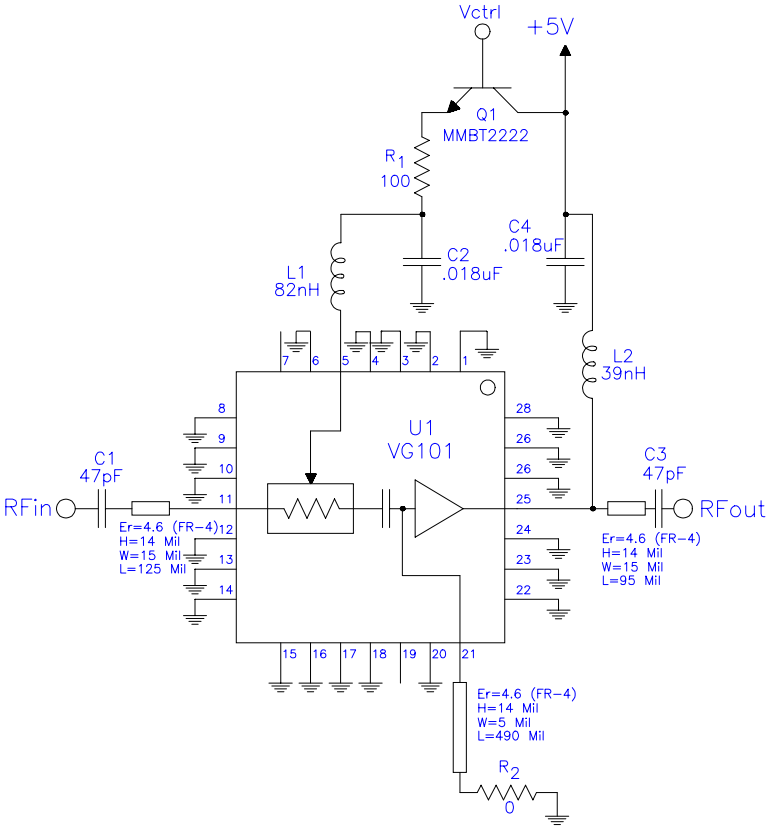
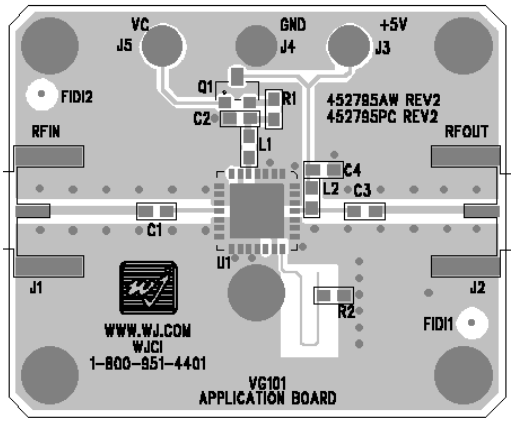
Specifications and information are subject to change without notice

Application Circuit: 750 – 1000 MHz (VG101-PCB)



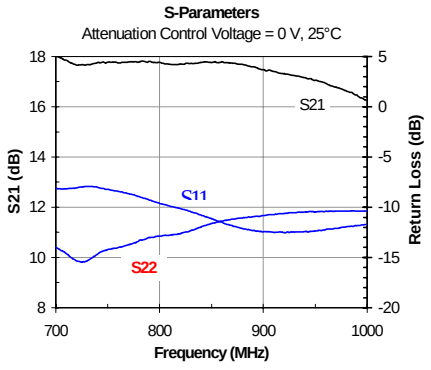


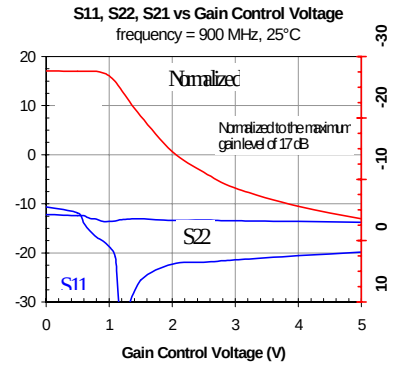
Circuit Board Material: .014" FR-4, 4 layers, .062" total thickness

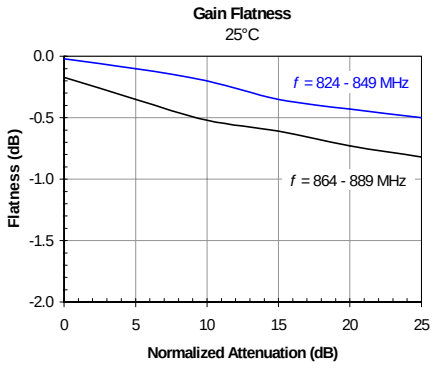
- Pin 21 needs to be connected to ground through a high impedance transmission line as shown for proper interstage matching. The position of R2 can be varied for optimal performance.
- The amplifier is biased through Pin 25 and should be connected directly into a voltage regulator.
- Distances are shown from the edge-to-edge for the land pattern.

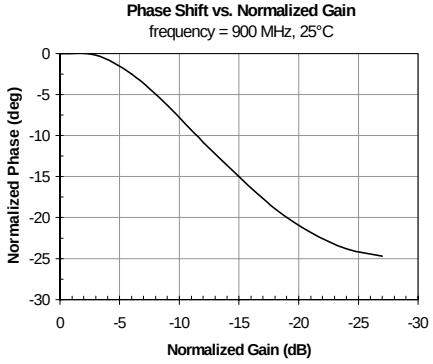
Bill of Materials

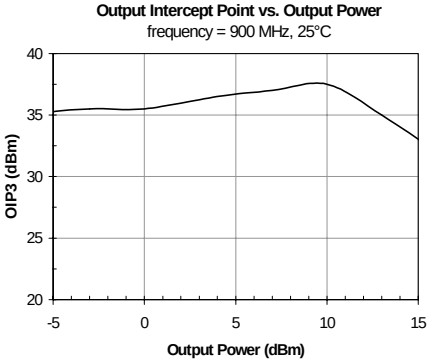
Ref. Des.	Description	Size
C1, C3	47 pF Chip Capacitor	0603
C2, C4	0.01 µF Chip Capacitor	0603
L1	82 nH Chip Inductor	0603
L2	39 nH Chip Inductor	0603
R1	100 Ω Chip Resistor	0603
Q1	MMBT2222 Motorola Transistor	SOT-23
U1	VG101 Variable Gain Amplifier	QFN 6x6

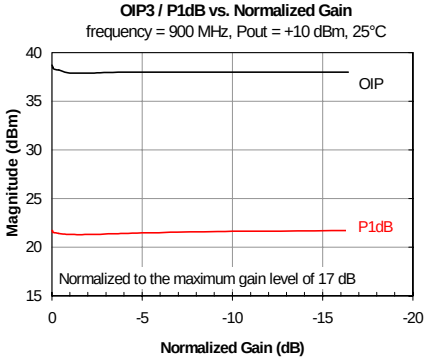












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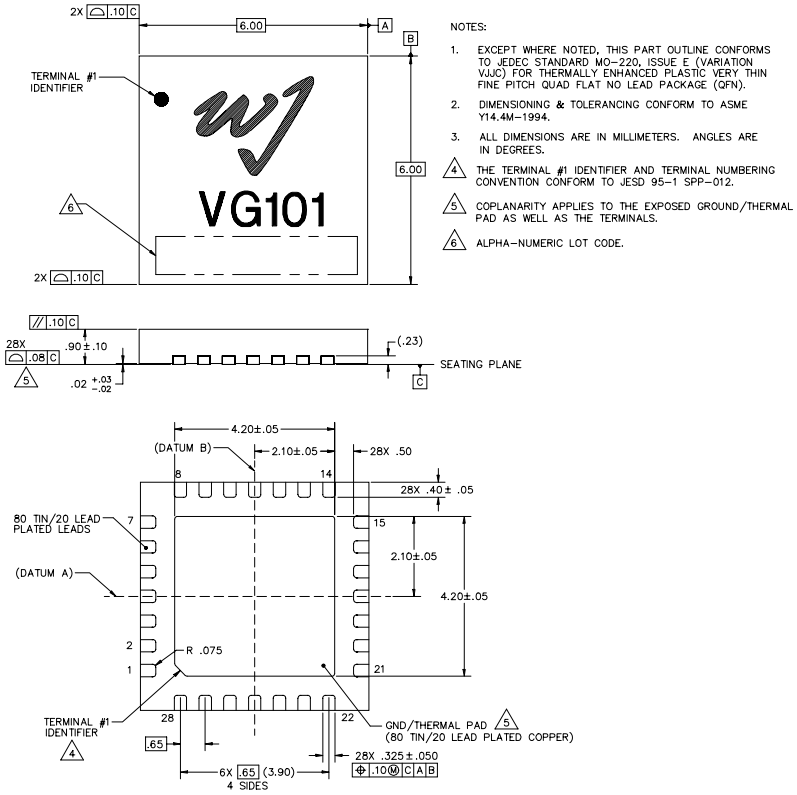
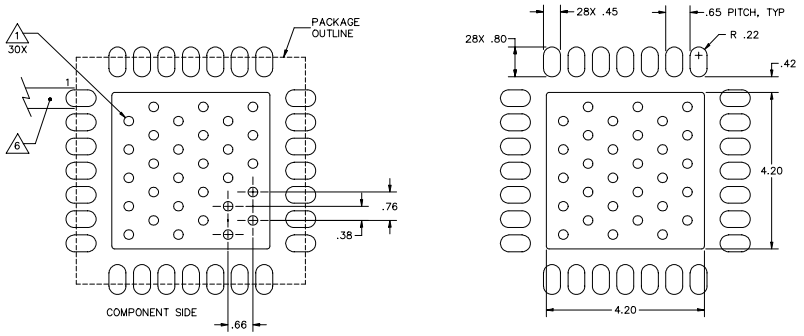
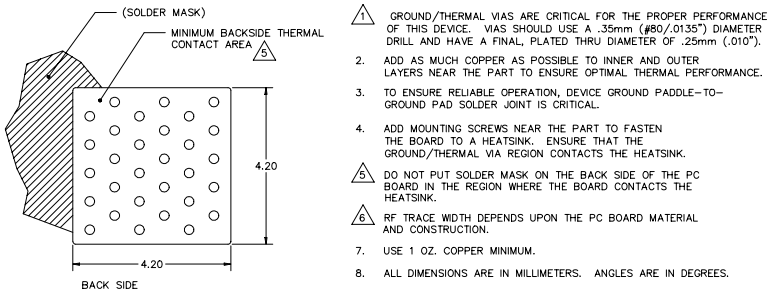
Outline Drawing



Mounting Configuration / Land Pattern





Product Marking

The component will be lasermarked with a "VG101" designator with a four-digit alphanumeric lot code on the top surface of the package. Tape and reel specifications for this part will be located on the website in the "Application Notes" section.

ESD / MSL Information

Caution! ESD sensitive device.

ESD Classification:	Class 1B
Value:	Passes 600 V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114
ESD Classification:	Class IV
Value:	Passes 1000 V
Test:	Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-C101
MSL Rating:	Level 1 at +250 °C convection reflow
Standard:	JEDEC Standard J-STD-020B

Functional Pin Layout

Pin	FUNCTION	Pin	FUNCTION
1	GND	15	GND
2	GND	16	GND
3	GND	17	GND
4	GND	18	GND
5	Gain control pin	19	N/C
6	GND	20	GND
7	N/C	21	Interstage Match
8	GND	22	GND
9	GND	23	GND
10	GND	24	GND
11	RF Input	25	RF Output / Bias
12	GND	26	GND
13	GND	27	GND
14	GND	28	GND