

# VGA001 *Variable Gain Amplifier*

- 100Hz - 100MHz Variable Gain Amplifier
- Fully differential input and output
- Can be used as single-ended input to differential output
- 3.3V Supply
- Designed in C3N (0.35 $\mu$ ) process (See General Notes 1)

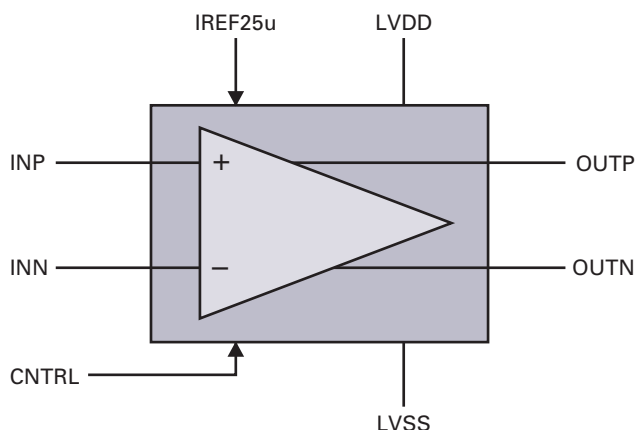
## 1.0 Description

The VGA001 is a voltage controlled Variable Gain Amplifier. It was designed for a maximum input signal of 600 $\mu$ V over a bandwidth of 100Hz to 100MHz. A control voltage must be provided to set the gain, and the typical range is -3dB to 17dB. Additional circuitry can be used to control the common mode voltage of the differential output. The current required for the common mode adjustment circuitry varies depending on the desired voltage level. (3)

## 2.0 Key Performance Features

Key Performance Features	Value
Nominal bandwidth	100Hz to 100MHz
Nominal gain range	-3dB to 17dB
Nominal reference current	25 $\mu$ A
Temperature range	0 – 85 $^{\circ}$ C
Nominal supply voltage, Vdd	3.3V
Nominal supply current, Idd	1.2mA
Maximum supply current (simulated)	2.2mA
Status	Functional Silicon (2)

## 3.0 Cell Pin Definition



Pin Name	Description
LVDD	Positive voltage supply
LVSS	Ground
IREF25u	Reference current
CNTRL	Gain control voltage
INP	Positive input
INN	Negative input
OUTP	Positive output
OUTN	Negative output

## 4.0 General Notes

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- (1) C3N is a double-poly process. The VGA could be used in a single-poly process, but some adjustment would be required because the resistivity of the poly would be slightly different.
- (2) Parts have only been evaluated in ceramic packages.
- (3) The common mode adjust circuit may require significant current to move the common mode voltage close to either supply rail.

## 5.0 Application Notes

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The VGA uses transistors to change the resistance seen by the amplifiers and changes the effective gain. However, the change in the resistance also changes the common mode voltage on the output, and thus a common mode adjust circuit may be required. The gain range is sensitive to the reference current and also to the external load; a differential buffer should be used when driving large loads.

The gain vs control voltage function is not linear, but it is monotonic, and centered approximately about  $V_{dd}/2$ .