

### Description

VCA-9 is a high-voltage, Via-Configurable Array (VCA) that contains 47 op-amps (30 of which operate at up to 20V), 3 Analog to Digital Converters (ADCs), 2 Digital to Analog Converters (DACs), supporting analog resources, and configurable logic gates (refer to Figure 1).

The analog I/O pads and internal analog resources are capable of operation at up to 20V, making this VCA an excellent fit for higher voltage applications. The balanced mix of op amps, data converters, and digital resources enable the design of analog filters, multi-channel data-acquisition circuits, and other mixed-signal processing applications. This VCA is perfectly suited to sweep up mixed-signal circuits that contain Analog Front-End (AFE) functions that require digital interfaces to devices such as FPGAs, DSPs, and microcontrollers. Applications include control loops, power management and sequencing, as well as simply integrating analog and digital glue functions.

Like all of Triad’s configurable devices, VCA-9 uses patented via-only, single-mask configuration allowing design changes in weeks rather than months, low development costs, reduced risk and support for any production volume.

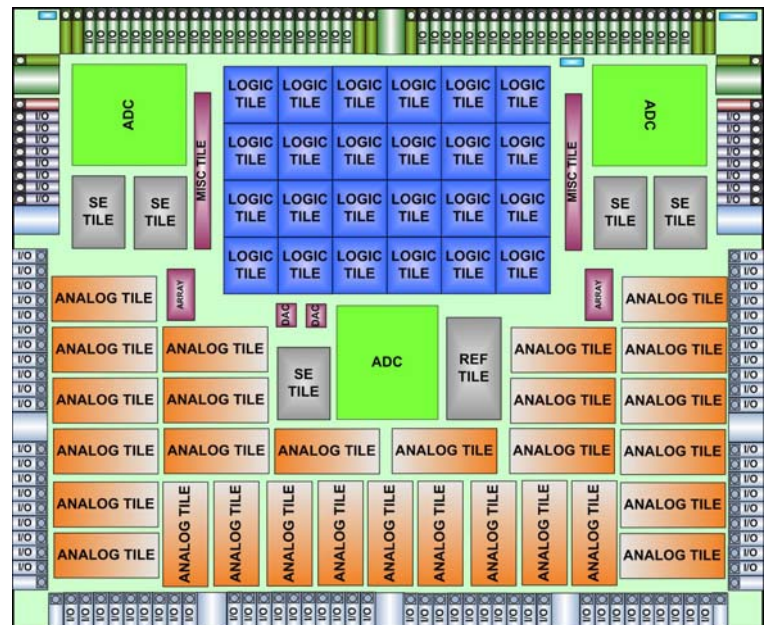


Figure 1: VCA-9 Via Configurable Array

### Resources & Capabilities

Resource	Quantity
Single-ended op-amps	47
Unity gain bandwidth	up to 50MHz
Discrete transistors	4000+
DACs	2
ADCs	3
ASIC Gates	18,000+
Memory	24K bits, single-port
Configurable I/O	140
Digital operating speed	60MHz system clock
Core logic voltage	3.3V
Analog & I/O voltage	up to 20V

### Applications

- FPGA/CLPD Plus Analog Replacement
- High Voltage Multi-channel Data Acquisition
- Power Management and Sequencing
- Control Loops & Motor Control
- Integration of High Voltage Discrete Components
- Boost, Buck, and LDO Regulators
- Smart Power
- High Voltage Sensor Interface

## VCA-9 Features Summary

- **Technology**
  - 0.35 $\mu$ m AMS high voltage process technology
  - 3.3V digital core voltage
  - 3.3V to 20V analog core voltage
- **Op-Amps**
  - 30 single-ended 20V op-amps with unity gain bandwidth up to 15MHz
  - 17 single-ended 3.3V op-amps with unity gain bandwidth up to 50MHz
  - Rail-to-rail operation
  - Via-configurable options per op-amp include: input type, output drive, input current, compensation, and more
- **Capacitors**
  - 5,276 individual capacitors
  - 933.6pF of total capacitance
  - 0.1, 0.2, 0.4pF capacitors
  - Excellent matching
- **Resistors**
  - 10,944 individual 6.5K $\Omega$  resistors
  - 71.136M $\Omega$  of total resistance
  - Excellent matching
- **MOSFETs**
  - 4,082 discrete transistors with various W/L ratios
  - 3,446 10V devices
  - 636 3.3V devices
  - 2,162 PFETs
  - 1,920 NFETs
- **Switches**
  - 168 individual analog switches
  - Low capacitance 5V t-gates
- **Digital to Analog Converters**
  - 2 Resistive DACs
  - 10-bit resolution
  - 1 $\mu$ s setting time
- **Analog to Digital Converters**
  - 3 Successive Approximation ADCs
  - 12-bit resolution
  - 1.5MSPS sampling rate
  - Single ended or fully-differential operation
- **Digital**
  - 18,400+ ASIC gates
  - 24K bits of single-port SRAM
  - RAMs Implemented as 24 64x16 SRAMs
  - 60MHz system speeds
- **Configurable I/O**
  - 94 Via-Configurable analog I/O
  - 46 Via-Configurable digital I/O
  - Digital I/O configuration options include: drive strength, tri-state, Schmitt input, pull-up/dn, ...
  - Analog I/O configuration options include 0, 50, and 1.5k $\Omega$  series resistance
- **Package Options**
  - Wide variety of customer defined package choices: 28-SOIC, 64-QFN, 80-BGA to 144-BGA, 64-TQFP to 144-TQFP

## VCA Platform Comparison

VCA-9 is part of a family of high voltage VCAs which also contains VCA-10 and VCA-11. All three VCAs in this family are similar in the types of analog and digital resources that they contain. Differences between them lie in the specific number of each type of resource. For comparison purposes, Table 1 illustrates these differences.

### What is a VCA?

VCA stands for Via Configurable Array. Triad’s VCAs are configurable mixed signal ASICs. Each VCA contains silicon-proven analog, digital and memory resources. A patented global routing fabric is placed over the top of all the resources. VCAs are staged at the semiconductor foundry awaiting a single via-layer mask change to configure and interconnect the analog and digital resources. To learn more about VCA technology please visit [www.triadsemi.com](http://www.triadsemi.com), call 336-774-2150, or email [info@triadsemi.com](mailto:info@triadsemi.com).

### Why Use VCAs?

**VCAs are the fast, inexpensive and safe way to create mixed signal ASICs.**

Designing with VCAs enables going from concept to working silicon in two to six months. VCA fabrication time is weeks instead of the three months typical of full-custom. By using Triad’s large IP library and growing family of VCAs, risk is minimized and time to working silicon is shortened. Because VCAs are reusable development costs are reduced and any production volume can be supported.

### Talk with a Triad System Architect about Your Design

Need to turn your idea into a single chip solution? Whether you have an idea, a working FPGA, discrete PCB schematic, or a full specification, Triad’s system architects are available to speak with you about your application and how we can help you turn your idea into your VCA. Contact us by Email at [info@triadsemi.com](mailto:info@triadsemi.com), by phone at 336-774-2150 or visit [www.triadsemi.com](http://www.triadsemi.com).

### Speak with a Triad Business Development Manager or Find your Local Rep

Contact one of Triad’s Business Development Managers to discuss the financial aspects of your project and to get an idea for just how accessible VCA technology can be for your business. Contact us by Email at [sales@triadsemi.com](mailto:sales@triadsemi.com), by phone at 336-774-2150 or find your local representative at [www.triadsemi.com/contact](http://www.triadsemi.com/contact).

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Resource	VCA-9	VCA-10	VCA-11
20V Op Amps	30	3	3
3.3/5V Op Amps	17	48	40
20V FETs	3,446	2,216	1,656
3.3/5V FETs	636	540	460
12-bit ADCs	3	1	1
10-bit DACs	2	2	2
ASIC Gates	18,400+	9,200+	6900+
SRAM (bits)	24K	12K	9K
20V Analog I/O	78	50	46
3.3/5V Analog I/O	16	50	42
Digital I/O	46	31	25
Min. BGA/QFN Size (mm)	8x9	8x8	7x7

**Table 1 VCA Family Resource Comparison**

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