Evaluation Board for Quad Low Noise, Low Cost, Variable Gain Amplifier

AD8335-EVAL

FEATURES

- Factory tested and ready to use
- SMA input and output connectors (8)
- Output test pins for differential probe
- Configurable jumpers for user opions:
  - Preamp enables
  - VGA enables
  - High/low gain settings
- Provisions for dynamic gain control
- Optional differential to single-ended output transformers
- Compact surface-mount layout can be applied to user-application
- Optional differential test pins at the input for instrument calibration

APPLICATIONS

- Hands-on testing of the AD8335
- Testing of input and output devices such as ultrasound probes and analog to digital converters

INTRODUCTION

The AD8335-EVAL board enables the user to quickly become familiar with the operating characteristics and features of the AD8335 quad VGA. Jumpers provide a convenient means for exercising the user-selectable features of the AD8335 preamp enables, VGA enables, and the fixed high and low gain ranges. Test pins are provided for power and dc gain voltage connections, and for input calibration and differential probes at the outputs. Provision is made for driving the gain-control ports with externally generated waveforms like those used in TGC applications.

All channels are tested for gain accuracy and functionality. The board is shipped with all the preamp and VGA channels enabled, and the low-gain mode selected. Jumpers are included to connect differential to single-ended output transformers, but the connections are open.

EVALUATION BOARD

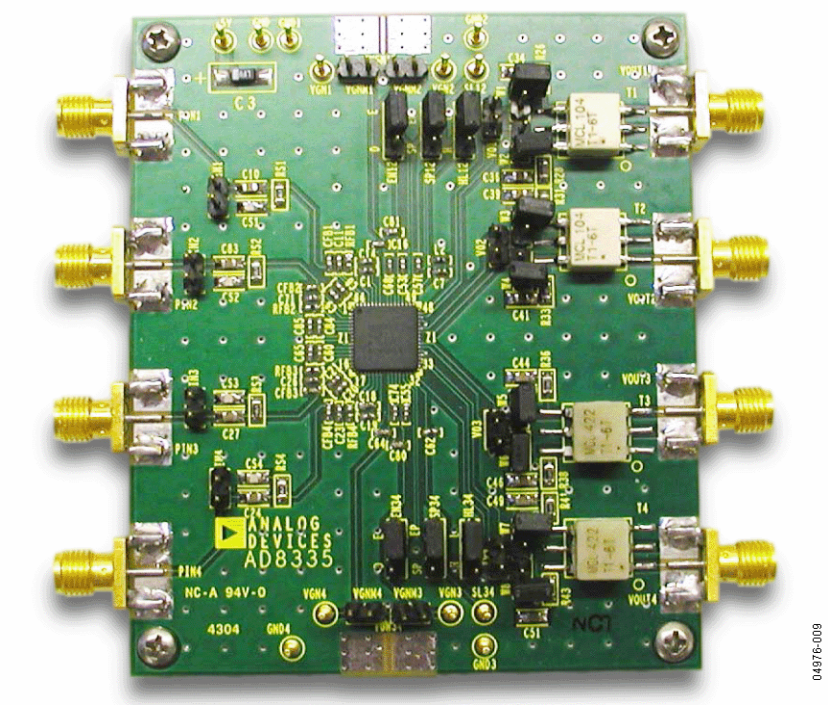

Figure 1.

Rev. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.326.8703

TABLE OF CONTENTS

REVISION HISTORY

11/04—Revision 0: Initial Version

GENERAL DESCRIPTION

The AD8335-EVAL evaluation board is a platform for the test and evaluation of the AD8335 variable gain amplifier (VGA.) The board is shipped assembled and tested, and users need only to connect the signal and VGAIN sources and a single 5 V power supply. Figure 3 is the schematic diagram.

The board is built and tested using the components shown in black in Figure 3. Optional SMA connectors (shown in gray) can be installed from an ac source to modulate the gain. When shipped, the jumpers are configured such that all four channels are enabled. Table 1 lists the jumpers and their functions.

Table 1. Jumper Functions

Jumper	Function
ENxx	E enables channels; D disables channels
SPxx	SP shuts down preamps; EP enables preamps
HLxx	H selects high gain; L selects low gain
W1–8	Insert to connect output transformers

The input impedance of the LNA is configured for 50 Ω to match the output impedance of most signal generators and network analyzers. Input impedances up to 14.7 kΩ are obtained with appropriate values of RFB1–4. Consult the AD8335 data sheet for details on this circuit feature. For reference, Table 2 lists some common values of input impedance and the corresponding feedback resistor value. The board is designed for surface-mount components.

Table 2. Preamp Feedback Resistor Values for Some Typical Values of Source Impedance

R_{IN} (Ω)	RFB1–4 (Ω, Nearest 1% Value)
50	249
200	1.02k
500	2.61k
1k	5.36k

The board is shipped fully enabled. Disabling of any of the preamps and VGAs is done in pairs: Channels 1 and 2, and Channels 3 and 4. The enable pins fully disable the preamp and VGA of the indicated channels, while the SP pins disable the preamps for lower power consumption, if the VGA is to be used alone.

Transformers are provided for differential to single-ended conversion of the output. Series resistors protect the output from accidental short circuits, limiting the output current. Transformer coupling is intended for high impedance loads.

The preferred signal detector is a high impedance differential probe connected to the 2-pin headers VOn, as indicated in Figure 3. 50 Ω single-ended loads can be connected directly via the transformer-coupled board edge SMA connectors. The 237 Ω resistors protect the outputs from accidental overload.

MEASUREMENT SETUP

The basic board connections for measuring bandwidth are shown in Figure 4. A 5 V, 200 mA (minimum) power supply is required, and a low noise voltage reference supply is required for VGNx inputs.

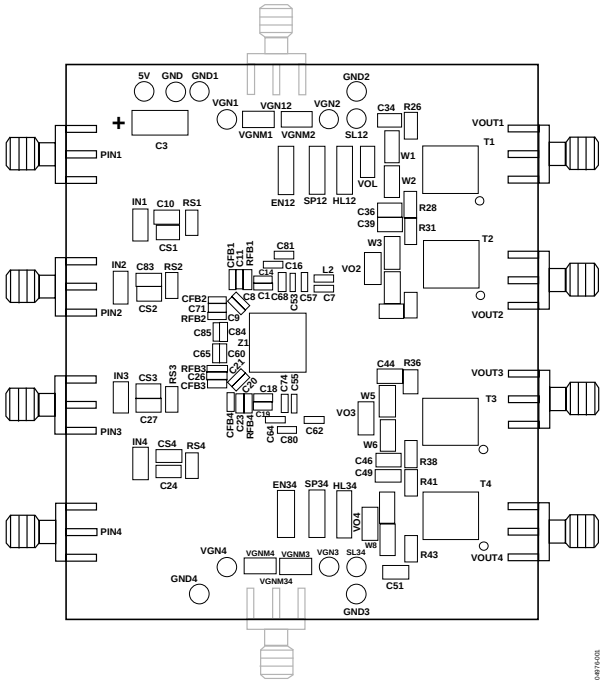

Figure 2. Evaluation Board Layout

EVALUATION BOARD SCHEMATIC

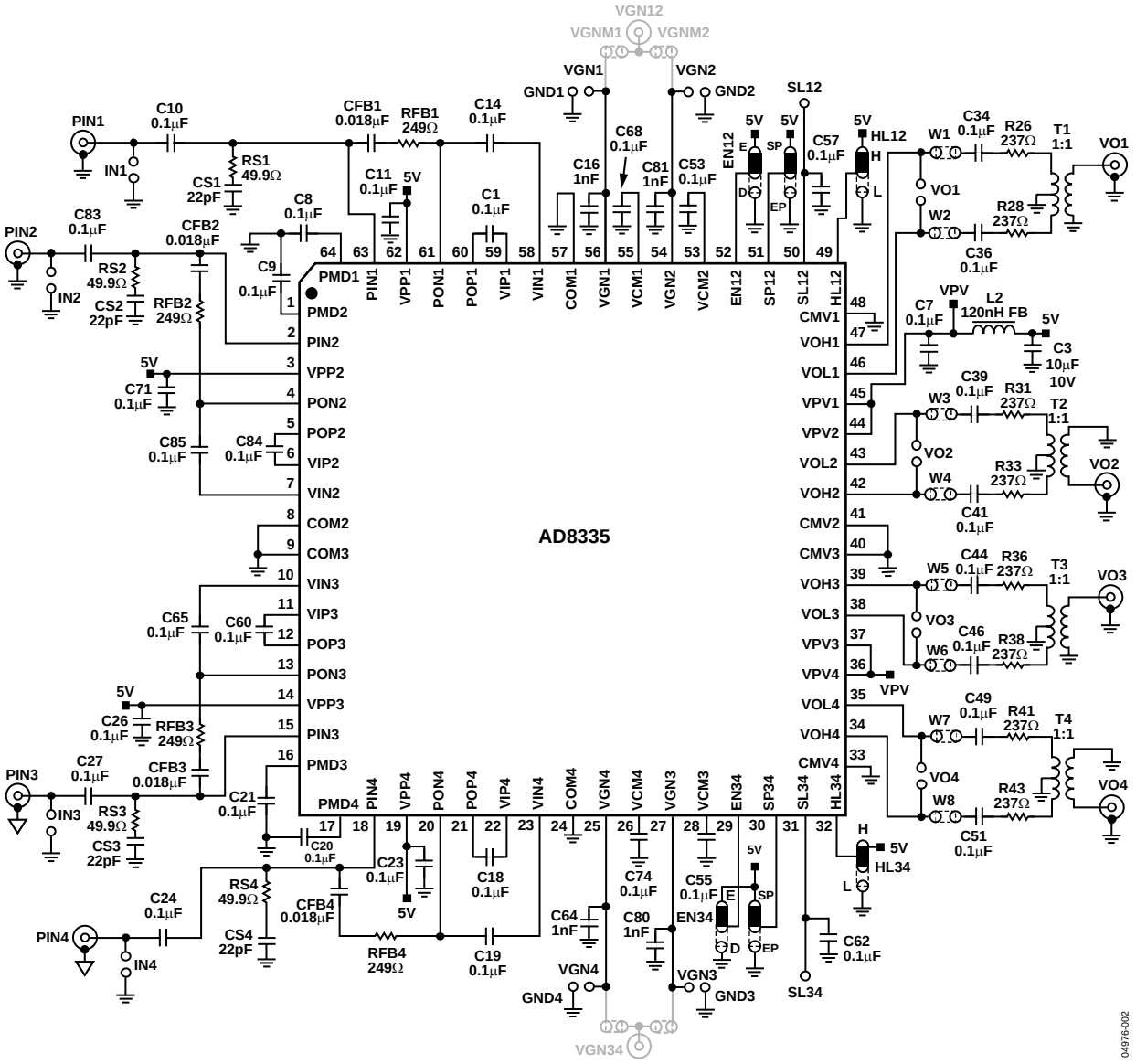

Figure 3. Evaluation Board Schematic

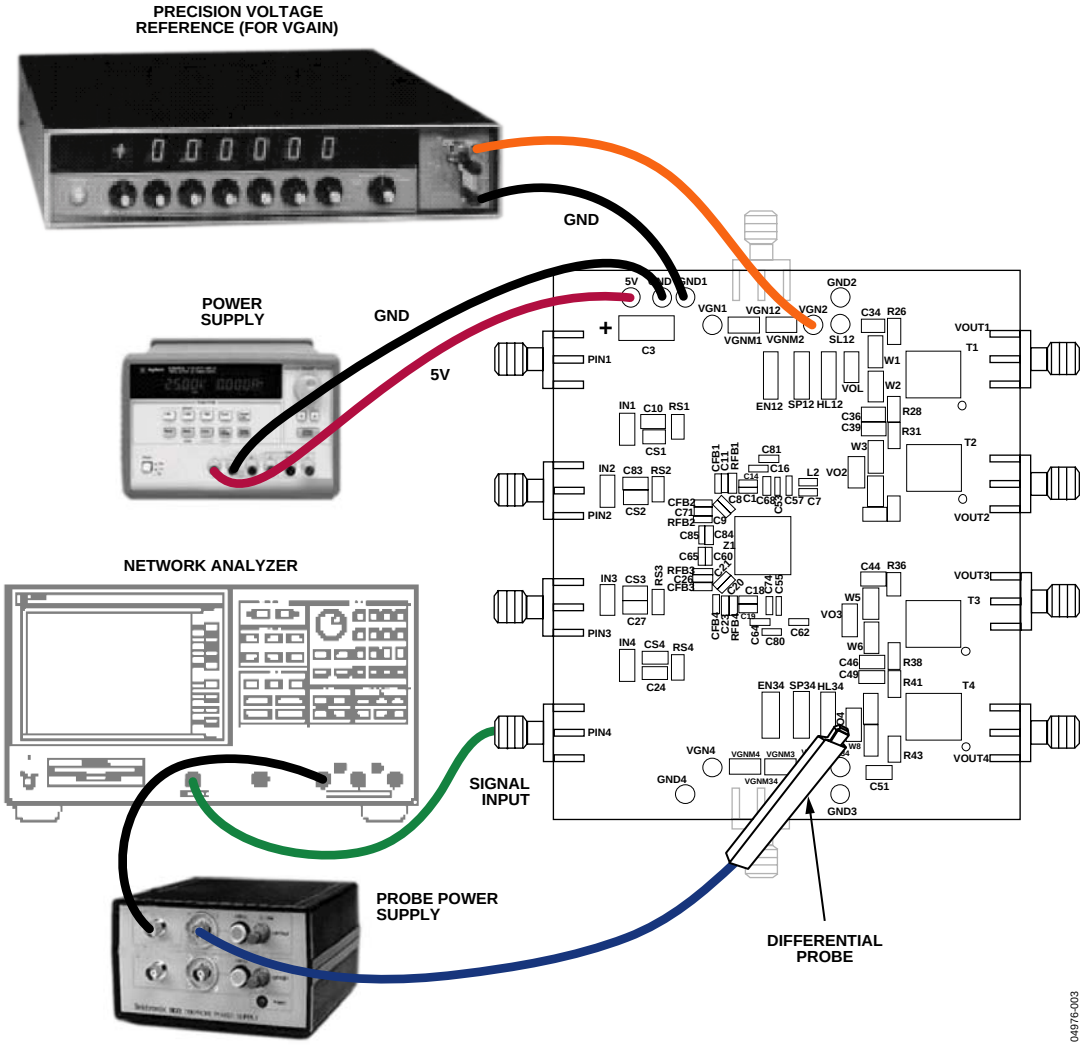

Figure 4. Typical Board Test Connections (One Channel Shown)

BOARD LAYOUT

The evaluation board circuitry has four layers: power and ground on the inner layers, and interconnecting circuitry on the outer layers. Figure 5 through Figure 8 illustrate the copper patterns.

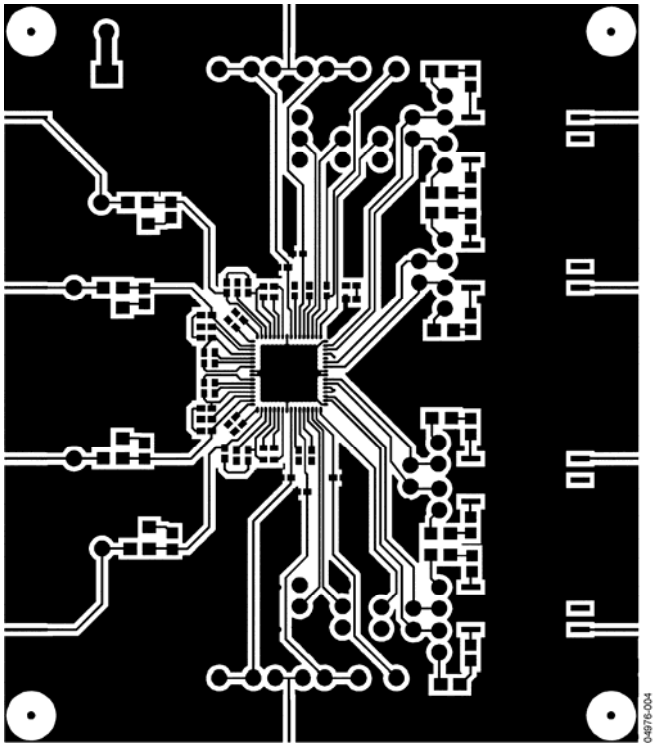

Figure 5. Component Side Copper

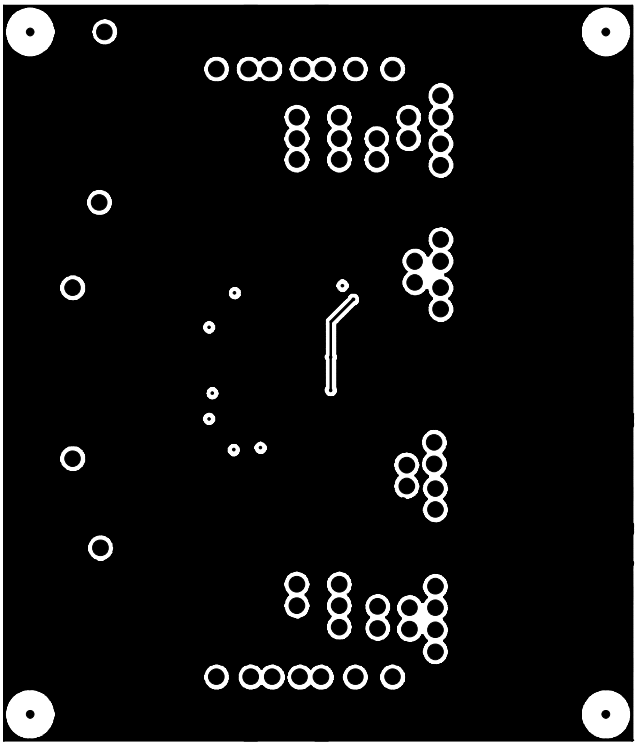

Figure 6. Wiring Side Copper

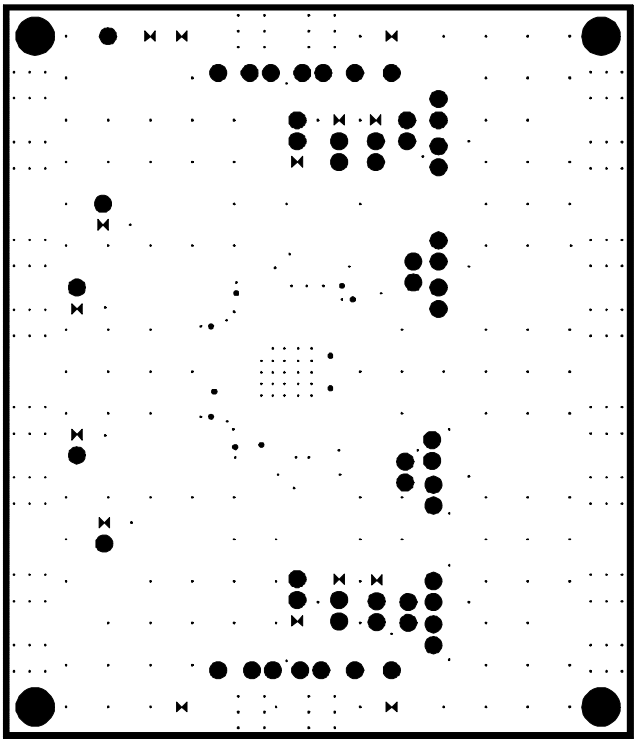

Figure 7. Inner Layer No. 1

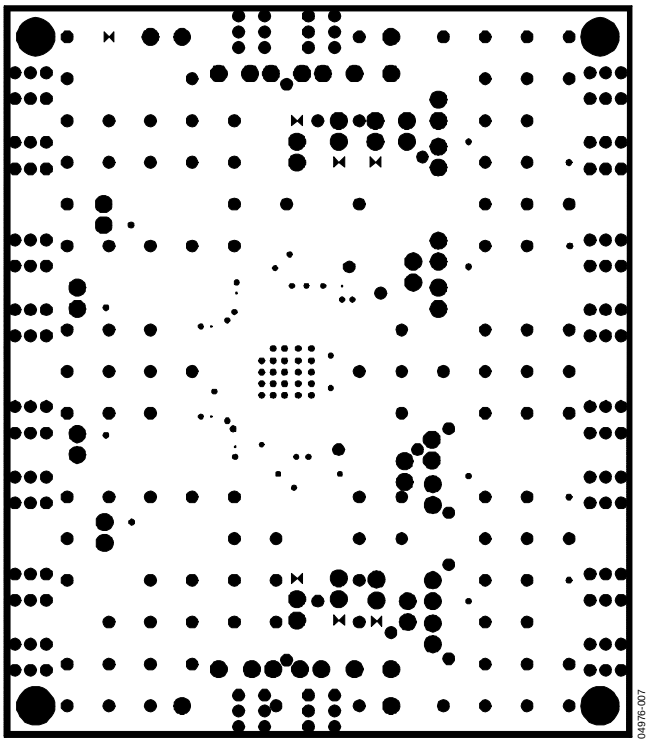

Figure 8. Inner Layer No. 2

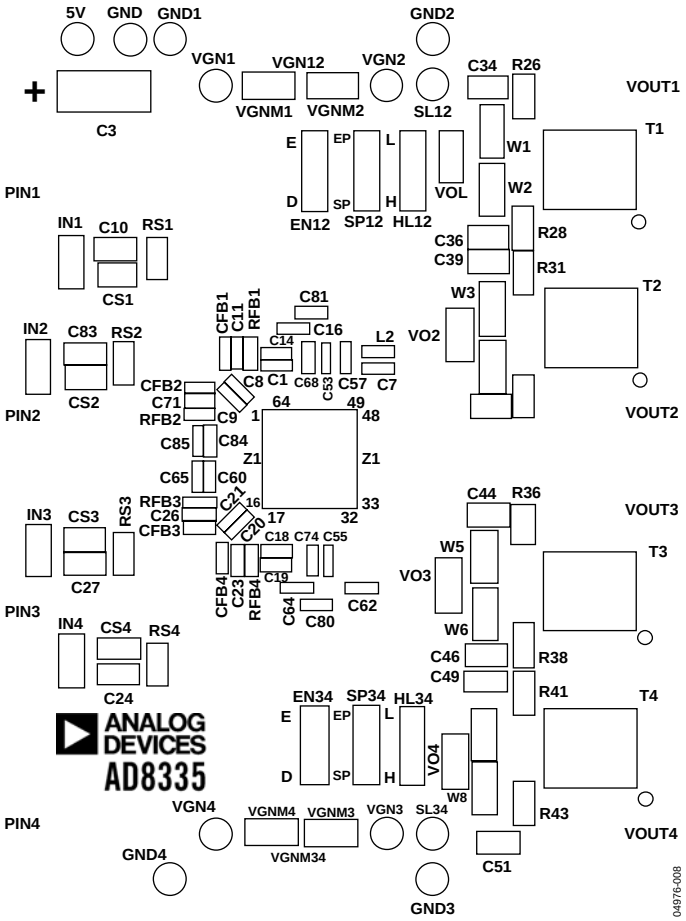

Figure 9. Component Side Silkscreen

ORDERING INFORMATION

PARTS LIST

Table 3.

Qty	Name	Description	Reference Designator	Manufacturer	Mfg Part Number
12	Test Pin	0.025 x .65" swaged gold plated	5 V, GND, GND1–4, SL12, 34, VGN1–4	Vector	K24A
23	Capacitor	0.1 µF, 16 V, 0402 ceramic	C1, 7–9, 11, 14, 18-21, 23, 26, 53, 55, 57, 60, 62, 65, 68, 71, 74, 84–85	Panasonic - ECG	ECJ-0EF1C104Z
1	Capacitor	10 µF, 10 V, tantalum, Size A	C3	Panasonic - ECG	ECS-T1AY106R
12	Capacitor	Capacitor, 0.1 µF, 16 V, 0805	C10, 24, 27, 34, 36, 39, 41, 44, 46, 49, 51, 83	Panasonic - ECG	ECJ-2VB1C104K
4	Capacitor	1 nF, 25 V, 0402	C16, 64, 80-81	Panasonic - ECG	ECJ-0EB1E102K
4	Capacitor	18 nF, 16 V, 0402	CFB1–4	AVX	0402YC183KAT2A
4	Capacitor	22 pF, 50 V, 0805	CS1–4	Panasonic - ECG	ECU-V1H220JCN
6	Header	3-pin 0.1" center	EN12, 34, SP12, 34, HL12, 34	Mill-Max	800-10-003-10-001
20	Header	2-pin 0.1" center	IN1–4, VO1–4, VGNM1–4, W1–8	Mill-Max	800-10-002-10-001
1	Ferrite Bead	120 nH, 0402	L2	Murata	BLM15BB750SN1D
8	Connector	SMA fem PC mount	PIN1–4, VO1-4	Johnson	142-0701-801
8	Resistor	237 Ω, 1% 0805	R26, 28, 31, 33, 36, 38, 41, 43	Panasonic - ECG	ERJ-6ENF2370V
4	Resistor	249 Ω, 1% 0402	RFB1–4	Panasonic - ECG	ERJ-2RKF2490X
4	Resistor	49.9 Ω, 1% 0805	RS1–4	Panasonic - ECG	ERJ-6ENF49R9V
4	Transformer	.015–300 MHz	T1–4	Mini Circuits	T1-6T KK81
1	IC	Quad VGA	U1	Analog Devices	AD8335ACPZ
4	Standoff	4–40 × 1/2" alum.			
4	Screw	4–40 × 1/4" SS			
14	Jumper	Mini-jumper	Install AT W1–8. EN12–34, HL12, 34, SP12, 34	FCI	65474-001

ORDERING GUIDE

Model	Description
AD8335-EVAL	Evaluation Board

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

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