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Evaluation Board for the AD8143/AD8145 High Speed, Triple Differential Receivers with Comparators

FEATURES

Full featured evaluation board for the AD8143/AD8145
Uses Cat-5 or SMA as inputs and VGA or SMA as outputs
±5 V operation

EVALUATION KIT CONTENTS

AD8143-EVALZ/AD8145-EVALZ evaluation board
Instruction guide for user guide download

EQUIPMENT NEEDED

Signal source or video pattern generator and signal analyzer
Power supply: ±5 V/1 A
Cat-5 cable or SMA to SMA cable for inputs
Male to male VGA cable or SMA to SMA cable for outputs
Display or monitor

GENERAL DESCRIPTION

The AD8143 and AD8145 are triple, low cost, differential to single-ended receivers, specifically designed for receiving red, green, and blue (RGB) signals over a twisted pair cable or differential printed circuit board (PCB) traces. These products can also receive any type of analog signal or high speed data transmission. Two auxiliary comparators with hysteresis are provided on both products to decode video sync signals encoded on the received common-mode voltages. These comparators receive digital signals or can be used as general-purpose comparators.

The AD8143 and AD8145 can be used in conjunction with the AD8133 and AD8134 triple differential drivers to provide a complete, low cost solution for RGB signals over Category-5 (Cat-5) UTP cable applications, including keyboards, videos, and mouses (KVM).

The excellent common-mode rejection of both the AD8143 and AD8145 allows the use of low cost, unshielded, twisted pair cables in noisy environments.

The AD8143 has a wide power supply range from single +5 V supply to ±12 V, which allows a wide common-mode range. The wide common-mode input range of the AD8143 maintains signal integrity in systems where the ground potential is a few volts different between the driver and receiver ends without using isolation transformers. The AD8143 is stable at a gain of 1. Closed-loop gain is easily set using external resistors.

The AD8145 can be configured for a differential to single-ended gain of 1 or 2 by connecting the GAIN_x pin of each channel to the respective output (gain = 1), or by connecting it to a reference voltage (gain = 2), which is normally grounded. On the AD8145, a REF_x input is provided on each channel that allows designers to level shift the output signals.

Both the AD8143 and AD8145 are available in a 5 mm × 5 mm, 32-lead LFCSP. The AD8143 is rated to work over the extended industrial temperature range of −40°C to +85°C, while the AD8145 can work over the extended industrial temperature range of −40°C to +105°C. Only the AD8145 has an automotive grade version that is qualified for use in automotive applications.

This user guide provides the supporting documents for the evaluation of the AD8143/AD8145. Consult the AD8143 and AD8145 data sheets, which provide additional information, when working with the evaluation board.

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REVISION HISTORY

9/15—Revision 0: Initial Version

EVALUATION BOARD PHOTOGRAPH AND BLOCK DIAGRAM

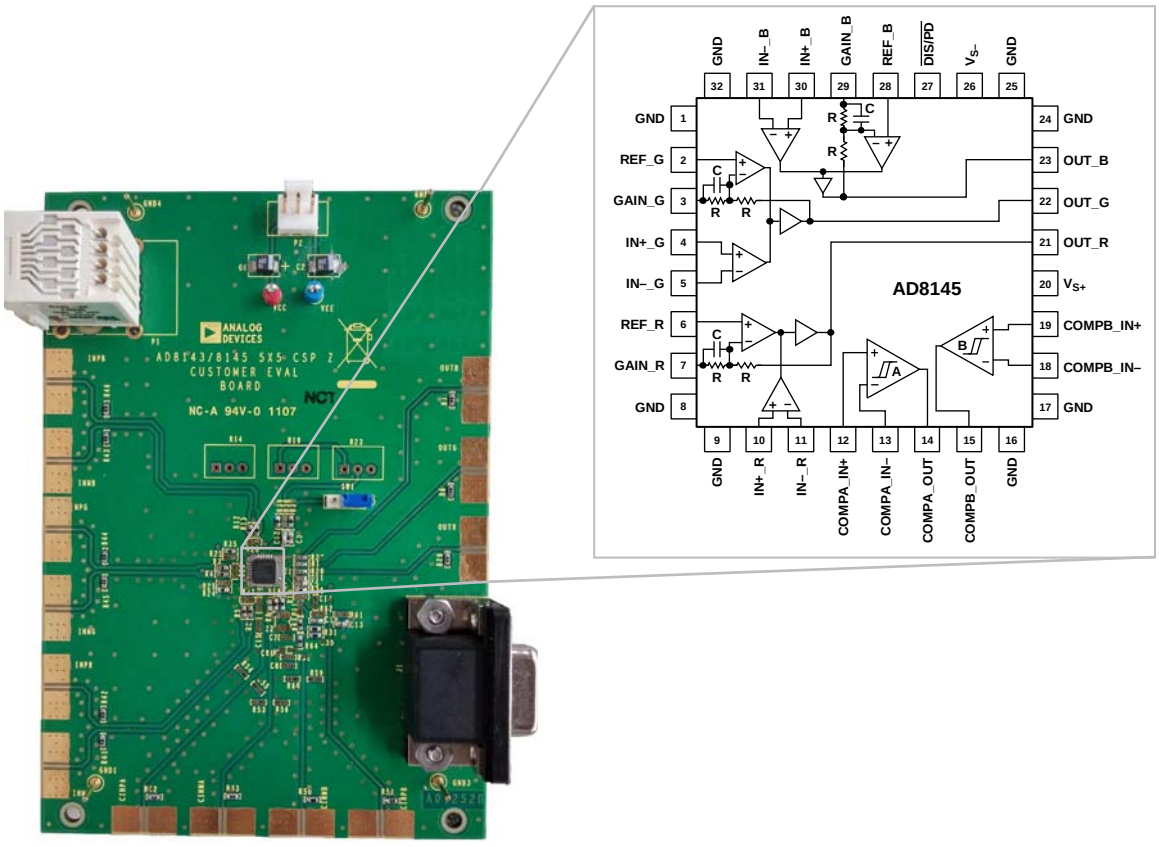

Figure 1.

EVALUATION BOARD HARDWARE

INTRODUCTION

The AD8143-EVALZ/AD8145-EVALZ evaluation board allows the user to evaluate the AD8143/AD8145 using both SMA and UTP cables. Figure 2 shows the typical bench setup used to evaluate the triple differential receivers with comparators.

POWER SUPPLY

This evaluation board requires a typical ±12 V power supply for testing the AD8143 and a ±5 V power supply for testing the AD8145. Both the AD8143 and AD8145 need a minimum power supply of 4.5 V. Connect the supplies as shown in Figure 2.

ANALOG INPUTS

Drive the inputs, either the SMA inputs (INPB, INNB, INPG, INNG, INPR, and INNR) or the Cat-5 UTP input (P1), with a waveform generator, a video pattern generator, or a signal source from a video driver.

ANALOG OUTPUT

For R_{LOAD} = 150 Ω, either the SMA outputs (OUTB, OUTG, and OUTR) or the VGA output (J1) of this evaluation board produce a voltage of approximately ±3.5 V for both the AD8143 and the AD8145. Check the waveform signal from this output using a signal analyzer, such as an oscilloscope or a display/monitor.

$\overline{\text{DIS/PD}}$ LOGIC INPUT

Pin $\overline{\text{DIS/PD}}$, represented by SW1, is a logic input used to reduce power consumption when either the AD8143 or the AD8145 is not in use and does not place the output in a high-Z state when asserted. Enable the AD8143 and AD8145 by pulling SW1 to the positive supply.

QUICK START GUIDE

To begin, take the following steps:

1. Remove the AD8143/AD8145 from the box.
2. Connect +5 V to VCC, −5 V to VEE, and GND to the center pin of P2.

Using the AD8147/AD8148 video driver as input, take the following steps:

1. Connect +5 V to VS+, −5 V to VS−, and GND to the center pin of P3 of the AD8147/AD8148 evaluation board.
2. Connect a video signal from a monitor/laptop or video pattern generator via the VGA port (P1 of the AD8147/AD8148 evaluation board).
3. Connect a Cat-5 UTP cable between P2 of the AD8147/AD8148 evaluation board and P1 of the AD8143/AD8145 evaluation board.
4. Connect a VGA cable between the J1 connector of the AD8143/AD8145 evaluation board and the output monitor to see the video output signal.
5. Turn on the power supply with ±5 V. The typical current of VCC/VS+ is 143 mA, and VEE/VS− is −122 mA.

Using a different analog signal as an input signal, take the following steps:

1. Connect a differential input signal that is typically ±2.5 V in INPB and INNB, INPG and INNG, or INPR and INNR through the SMA to SMA connector between a signal generator or video pattern generator and the differential inputs.
2. Connect an oscilloscope or a display/monitor to J1 through the VGA connector.
3. Turn on the power supply with ±5 V.
4. Turn on the input source. J1 must produce the signal from the inputs depending on the configured gain.

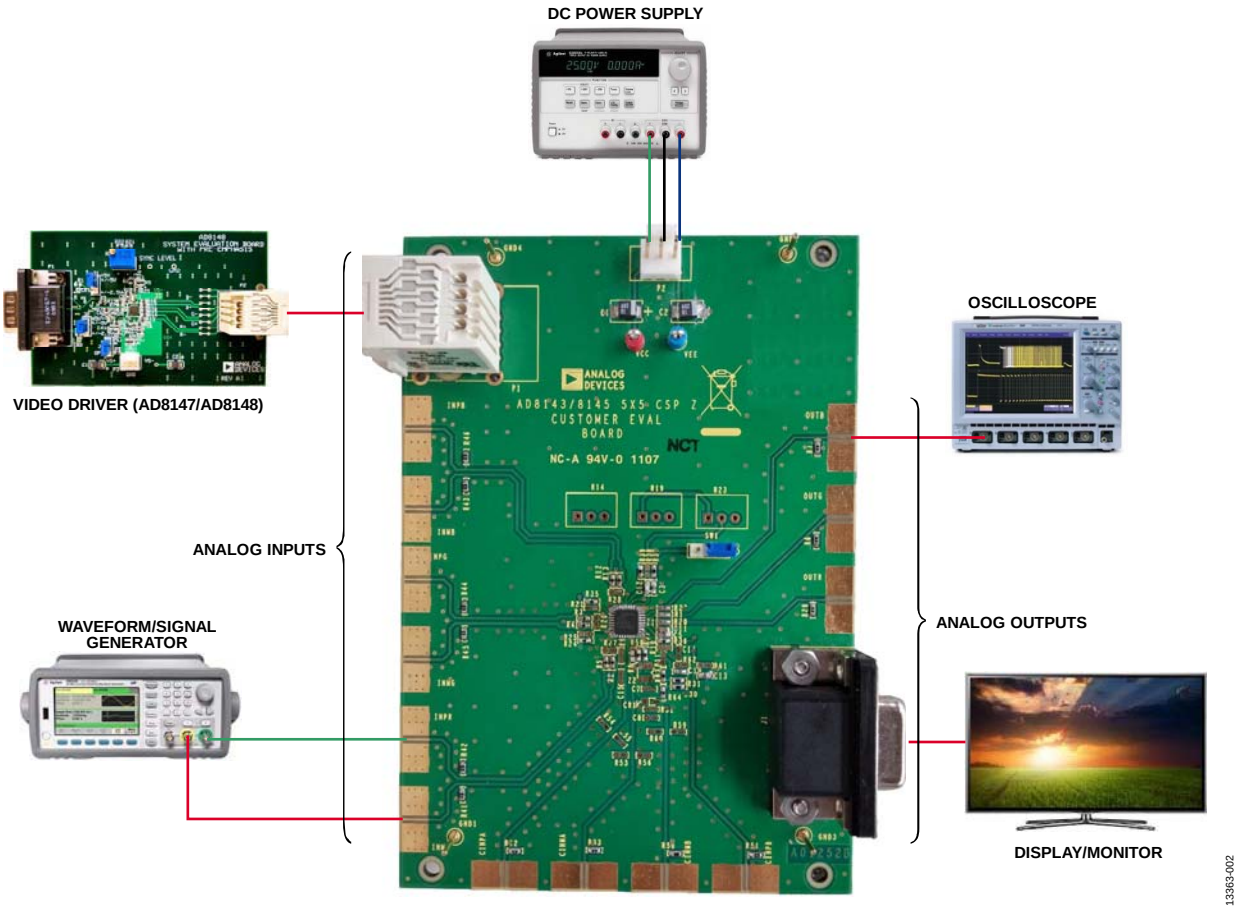

Figure 2. Typical AD8143-EVALZ/AD8145-EVALZ Evaluation Board Setup

EVALUATION BOARD SCHEMATICS AND ARTWORK

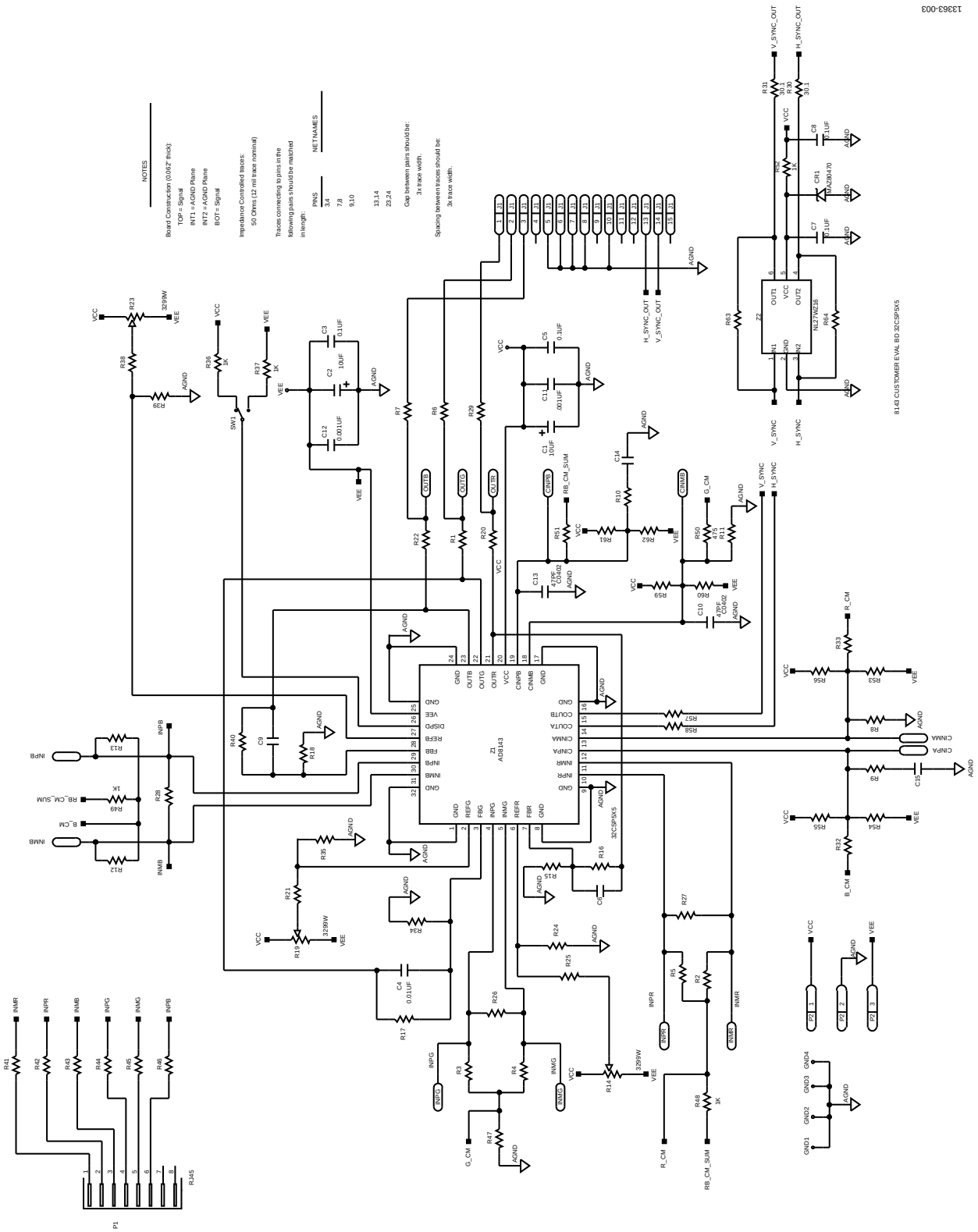

Figure 3. AD8143-EVALZ/AD8145-EVALZ Evaluation Board Schematic

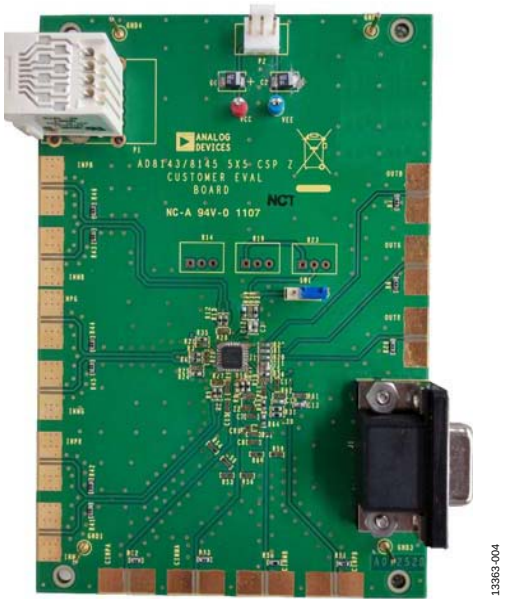

Figure 4. AD8143-EVALZ/AD8145-EVALZ Evaluation Board, Front View

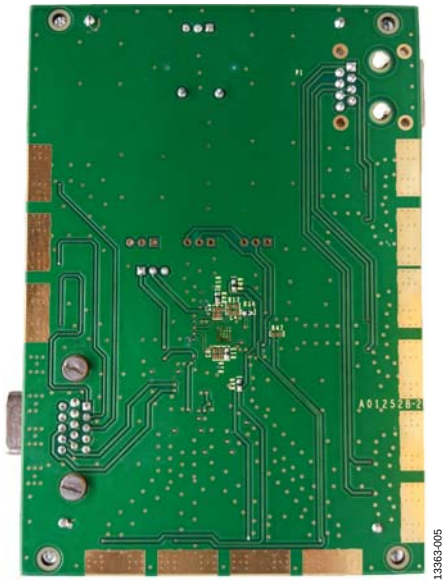

Figure 5. AD8143-EVALZ/AD8145-EVALZ Evaluation Board, Rear View

BILL OF MATERIALS

Table 1. AD8143 Bill of Materials

Item	Qty	Reference Designator	Description	Manufacturer	Part Number
1	19	R6, R7, R18, R24, R29, R32 to R35, R39, R41 to R46, R51, R57, R58	0, R0402	Multicomp	0402WGF0000TCE
2	3	R1, R20, R22	75, R0402	Panasonic	ERJ-2RKF75R0X
3	5	R36, R37, R48, R49, R52	1k, R0402	Panasonic	ERJ-2RKF1001X
4	2	R30, R31	30.1, R0402	Panasonic	ERJ-2RKF30R1X
5	6	R2 to R5, R12, R13	49.9, R0402	Panasonic	ERJ-2RKF49R9X
6	1	R50	475, R0402	Panasonic	ERJ-2RKF4750X
7	2	C1, C2	10 µF, 3528	AVX	TAJB106K020RNJ
8	4	C3, C5, C7, C8	0.1 µF, C0402	Murata	GRM155R71C104KA88D
9	3	C4, C11, C12	0.01 µF, C0402	TDK	C1005X8R1E103K
10	2	C10, C13	47 pF, C0402	Murata	GCM1555C1H470JZ13D
11	1	Z1	AD8143, 32CSP5X5	Analog Devices, Inc.	AD8143ACPZ
12	13	CINMA, CINMB, CINPA, CINPB, INMB, INMG, INMR, INPB, INPG, INPR, OUTB, OUTG, OUTR	SMACONRAA1, SMASMT	Rosenberger	32K243-40ML5
13	4	GND1 to GND4	Test point, TP1	Keystone Electronics Corp.	5006
14	1	J1	CON15_FEM, CONN_A012	TE Connectivity	1-1734530-1
15	1	P1	RJ45	TE Connectivity	RJ45-8X
16	1	P2	3-pin	Molex	22-11-2032
17	1	SW1	SIP3	Molex	22-03-2031
18	1	VCC	Test point, TP1	Keystone Electronics Corp.	5000
19	1	VEE	Test point, TP1	Keystone Electronics Corp.	5004
20	4	C6, C9, C14, C15	Variable, C0402	Do not insert	Do not insert
21	1	CR1	MAZ80470, SC76		
22	17	R8 to R11, R21, R25 to R28, R38, R47, R53, R55, R56, R59 to R62	Variable, R0402	Do not insert	Do not insert
23	3	R14, R19, R23	Variable, 3299W	Do not insert	Do not insert
24	4	R15 to R17, R40	499, R0402	Panasonic	ERJ-2RKF4990X
25	1	R54	R0402	Do not insert	Do not insert
26	2	R63, R64	0, R0402	Multicomp	0402WGF0000TCE
27	1	Z2	NL27WZ16, SOT23_6	ON Semiconductor	NL27WZ16DFT2G

Table 2. AD8145 Bill of Materials

Item	Qty	Reference Designator	Description	Manufacturer	Part Number
1	22	R6, R7, R15, R18, R24, R29 to R35, R39, R41 to R46, R63, R64, R51	0, R0402	Multicomp	0402WGF0000TCE
2	3	R1, R20, R22	75, R0402	Panasonic	ERJ-2RKF75R0X
3	4	R36, R37, R48,R49	1k, R0402	Panasonic	ERJ-2RKF1001X
4	2	R57, R58	30.1, R0402	Panasonic	ERJ-2RKF30R1X
5	6	R2 to R5, R12, R13	49.9, R0402	Panasonic	ERJ-2RKF49R9X
6	1	R50	475, R0402	Panasonic	ERJ-2RKF4750X
7	2	C1, C2	10 µF, 3528	AVX	TAJB106K020RNJ
8	2	C3, C5	0.1 µF, C0402	Murata	GRM155R71C104KA88D
9	2	C11, C12	0.01 µF, C0402	TDK	C1005X8R1E103K
10	2	C10, C13	47 pF, C0402	Murata	GCM1555C1H470JZ13D
11	1	Z1	AD8145, 32CSP5X5	Analog Devices	AD8145ACPZ
12	13	CINMA, CINMB, CINPA, CINPB, INMB, INMG, INMR, INPB, INPG, INPR, OUTB, OUTG, OUTR	SMACONRAA1, SMASMT	Rosenberger	32K243-40ML5
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16	1	P2	3-pin	Molex	22-11-2032
17	1	SW1	SIP3	Molex	22-03-2031
18	1	VCC	Test point, TP1	Keystone Electronics Corp.	5000
19	1	VEE	Test point, TP1	Keystone Electronics Corp.	5004

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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