High-Speed Triple Differential Receiver with Comparators

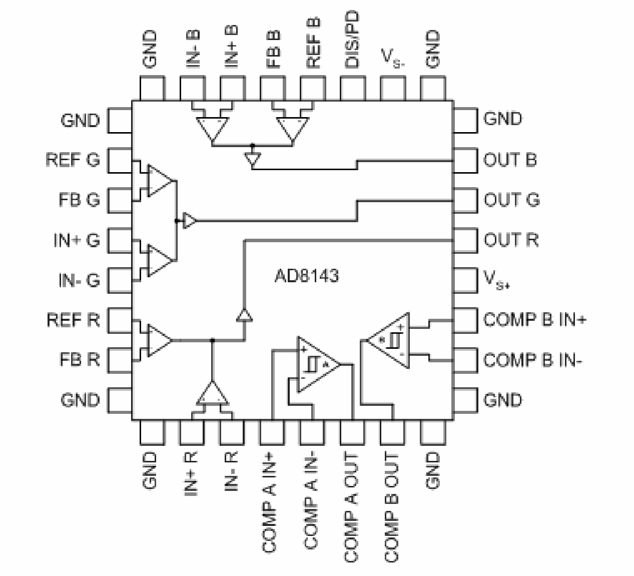
Preliminary Technical Data

AD8143

FEATURES

High Speed
300MHz, 1000V/ µs @ G = 1, V_O = 1 V $_{P-P}$
High CMRR: 70dB @ 10MHz
High Differential Input Impedance: 6MΩ
Imput Common Mode Range: ± 10 V (± 12 V Supplies)
User Adjustable Gain
Wide Power Supply range: + 4.5V to ± 12V
Fast Settling: 2ns to 1%, 5 ns to 0.1%
Low Noise: 12 nV/√ Hz
Small Packaging: 32-Pin 5 x 5 mm LFCSP Package

PINOUT DIAGRAM



Exposed Pad on Underside of Device Connects to Ground

APPLICATIONS

RGB Video Receiver
KVM (Keyboard-Video-Mouse)
UTP (Unshielded Twisted Pair) Receiver

GENERAL DESCRIPTION

The AD8143 is a triple, low cost differential to single ended receiver specifically designed for receiving RGB (red-green-blue) signals over twisted pair cable but can also be used for receiving any type of analog signal or high speed data transmission. Two auxiliary comparators are also provided to receive digital or sync signals. The AD8143 can be used in conjunction with the AD8133 triple, differential driver to provide a complete low cost solution for RGB over Category-5 unshielded twisted pair (UTP) cable applications including KVM (keyboard-video-mouse).

The excellent common-mode rejection (60dB @ 10 MHz) of the AD8143 allows for 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 for 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 drive and receive ends without the use of isolation transformers.

The AD8143 is stable at a gain of 1. The closed-loop gain can easily be set by external resistors.

The AD8143 is available in a 5 mm x 5 mm 32 lead LFCSP package and is rated to work over the extended industrial temperature range, -40°C to +85°C.

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REVISION HISTORY

Revision 0: Initial Version (01/10/2004)

Revision A: Changed to 32 pin 5 mm x 5 mm LFCSP package (12/22/2004)

Revision B: Changed Spec Tables re: R_L, SSBW, LSBW (V_{OUT} = 1 V_{pp} & 2 V_{pp}), SR, I_s (03/07/2005), updated description (3/7/2005)

AD8143— SPECIFICATIONS

(T_A=25°C, Vs = ± 12V, REF= 0V, R_L= 150 Ω, C_L=2 pF, G = +1, T_{MIN} to T_{MAX} = -40°C to +85°C unless otherwise noted.)

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3dB Bandwidth	V_{out} = 0.2Vp-p		360		MHz
	V_{out} = 1 Vp-p		330		MHz
	V_{out} = 2 V p-p, R_L = 150Ω		250		MHz
Bandwidth for 0.1dB Flatness	V_{out} = 0.2Vp-p		50		MHz
Slew Rate	V_{out} = 2Vp-p		1000		V/μs
Settling Time	V_{out} = 2Vp-p, 1.0%		2.0		ns
	V_{out} = 2Vp-p, 0.1%		5.0		ns
Rise and Fall Time	V_{out} = 1Vp-p, 10% to 90%		1.0		ns
Output Overdrive Recovery			40		ns
NOISE/DISTORTION					
Second Harmonic	V_{out} = 1 Vp-p, 1MHz		-75		dBc
Third Harmonic	V_{out} = 1 Vp-p, 1MHz		-78		dBc
Crosstalk	V_{out} = 1 Vp-p, 10MHz		-60		dB
Input Voltage Noise (RTI)	f ≥10kHz		12		nV/√Hz
Differential Gain Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		%
Differential Phase Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		°
INPUT CHARACTERISTICS					
Common-Mode Rejection	f = DC to 100kHz, V_{CM} = -3V to +3.5V		110		dB
	V_{CM} = 1 Vp-p, f =10MHz		70		dB
	V_{CM} = 1Vp-p, f = 100MHz		40		dB
Common-Mode Voltage Range	V_{+IN} – V_{-IN} = 0V		±10.5		V
Differential Operating Range			±2.5		V
Resistance	Differential		6		MΩ
	Common-Mode		4		MΩ
Capacitance	Differential		3		pF
	Common-Mode		4		pF
DC PERFORMANCE					
Open-Loop Gain	V_{OUT} = ±1V		74		dB
Input Offset Voltage			0.5	10	mV
	T_{MIN} to T_{MAX}		10		μV/°C
Input Bias Current (+IN, -IN)			± 0.5	± 2.0	μA
Input Bias Current (REF, FB)			±1.0	± 3.5	μA
Input Bias Current Drift	T_{MIN} to T_{MAX} (+IN, -IN, REF, FB)		5		nA/°C
Input Offset Current	(+IN, -IN, REF, FB)		± 0.08	± 0.4	μA
Input Offset Current Drift	T_{MIN} to T_{MAX}		0.2		nA/°C
OUTPUT PERFORMANCE					
Voltage Swing	R_{LOAD} = 150Ω / 1kΩ	3.6 / 4.0			± V
Output Current			40		mA
Short Circuit Current			60		mA
POWER SUPPLY					
Quiescent Supply Current	Total		45		mA

AD8143— SPECIFICATIONS

(T_A=25°C, VS= ± 5 V, REF= 0V, R_L=150 Ω, C_L= 2 pF, G = +1, T_{MIN} to T_{MAX} = -40 to +85°C unless otherwise noted.)

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3dB Bandwidth	V_{out} = 0.2Vp-p		300		MHz
	V_{out} = 1 Vp-p		250		MHz
	V_{out} = 2 V p-p, R_L = 150Ω		250		MHz
Bandwidth for 0.1dB Flatness	V_{out} = 0.2Vp-p		50		MHz
Slew Rate	V_{out} = 2Vp-p		1000		V/µs
Settling Time	V_{out} = 2Vp-p, 1.0%		2.0		ns
	V_{out} = 2Vp-p, 0.1%		5.0		ns
Rise and Fall Time	V_{out} = 1Vp-p, 10% to 90%		1.0		ns
Output Overdrive Recovery			40		ns
NOISE/DISTORTION					
Second Harmonic	V_{out} = 1 Vp-p, 1MHz		-75		dBc
Third Harmonic	V_{out} = 1 Vp-p, 1MHz		-78		dBc
Crosstalk	V_{out} = 1 Vp-p, 10MHz		-60		dB
Input Voltage Noise (RTI)	f ≥10kHz		12		nV/√Hz
Differential Gain Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		%
Differential Phase Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		°
INPUT CHARACTERISTICS					
Common-Mode Rejection	f = DC to 100kHz, V_{CM} = -3V to +3.5V		110		dB
	V_{CM} = 1 Vp-p, f =10MHz		70		dB
	V_{CM} = 1Vp-p, f = 100MHz		40		dB
Common-Mode Voltage Range	$V_{+IN} – V_{-IN}$ = 0V		±3.8		V
Differential Operating Range			±2.5		V
Resistance	Differential		6		MΩ
	Common-Mode		4		MΩ
Capacitance	Differential		3		pF
	Common-Mode		4		pF
DC PERFORMANCE					
Open-Loop Gain	V_{OUT} = ±1V		74		dB
Input Offset Voltage			0.5	10	mV
	T_{MIN} to T_{MAX}		10		µV/°C
Input Bias Current (+IN, -IN)			± 0.5	± 2.0	µA
Input Bias Current (REF, FB)			±1.0	± 3.5	µA
Input Bias Current Drift	T_{MIN} to T_{MAX} (+IN, -IN, REF, FB)		5		nA/°C
Input Offset Current	(+IN, -IN, REF, FB)		± 0.08	± 0.4	µA
Input Offset Current Drift	T_{MIN} to T_{MAX}		0.2		nA/°C
OUTPUT PERFORMANCE					
Voltage Swing	R_{LOAD} = 150Ω / 1kΩ	3.6 / 4.0			± V
Output Current			40		mA
Short Circuit Current			60		mA
POWER SUPPLY					
Quiescent Supply Current	Total		35		mA

AD8143— SPECIFICATIONS

(T_A=25°C, Vs= +5 V, REF= 0V, R_L=150Ω, C_L= 2pF, G= +1, T_{MIN} to T_{MAX} = -40 to +85°C unless otherwise noted.)

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3dB Bandwidth	V_{out} = 0.2Vp-p		210		MHz
	V_{out} = 2 V p-p, R_L = 150Ω		130		MHz
Bandwidth for 0.1dB Flatness	V_{out} = 0.2Vp-p		30		MHz
Slew Rate	V_{out} = 2Vp-p		950		V/μs
Settling Time	V_{out} = 2Vp-p, 1.0%		2.0		ns
	V_{out} = 2Vp-p, 0.1%		5.0		ns
Rise and Fall Time	V_{out} = 1Vp-p, 10% to 90%		1.0		ns
Output Overdrive Recovery			40		ns
NOISE/DISTORTION					
Second Harmonic	V_{out} = 1 Vp-p, 1MHz		-68		dBc
Third Harmonic	V_{out} = 1 Vp-p, 1MHz		-72		dBc
Crosstalk	V_{out} = 1 Vp-p, 10MHz		-60		dB
Input Voltage Noise (RTI)	f ≥10kHz		12		nV/√Hz
Differential Gain Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		%
Differential Phase Error	NTSC, 200 IRE, R_L ≥150Ω		0.15		°
INPUT CHARACTERISTICS					
Common-Mode Rejection	f = DC to 100kHz, V_{CM} = -3V to +3.5V		96		dB
	V_{CM} = 1 Vp-p, f =10MHz		70		dB
	V_{CM} = 1Vp-p, f = 100MHz		40		dB
Common-Mode Voltage Range	V_{+IN} – V_{-IN} = 0V	1.2		3.8	V
Differential Operating Range			±2.3		V
Resistance	Differential		6		MΩ
	Common-Mode		4		MΩ
Capacitance	Differential		3		pF
	Common-Mode		4		pF
DC PERFORMANCE					
Open-Loop Gain	V_{OUT} = ±1V		71		dB
Input Offset Voltage			0.5	10	mV
	T_{MIN} to T_{MAX}		10		μV/°C
Input Bias Current (+IN, -IN)			± 0.5	± 2.0	μA
Input Bias Current (REF, FB)			±1.0	± 3.5	μA
Input Bias Current Drift	T_{MIN} to T_{MAX} (+IN, -IN, REF, FB)		5		nA/°C
Input Offset Current	(+IN, -IN, REF, FB)		± 0.08	± 0.4	μA
Input Offset Current Drift	T_{MIN} to T_{MAX}		0.2		nA/°C
OUTPUT PERFORMANCE					
Voltage Swing	R_{LOAD} = 150Ω / 1kΩ	1.4 / 1.0		3.6 / 4.0	± V
Output Current			35		mA
Short Circuit Current			60		mA
POWER SUPPLY					
Quiescent Supply Current	Total		35		mA

OUTLINE DIMENSIONS

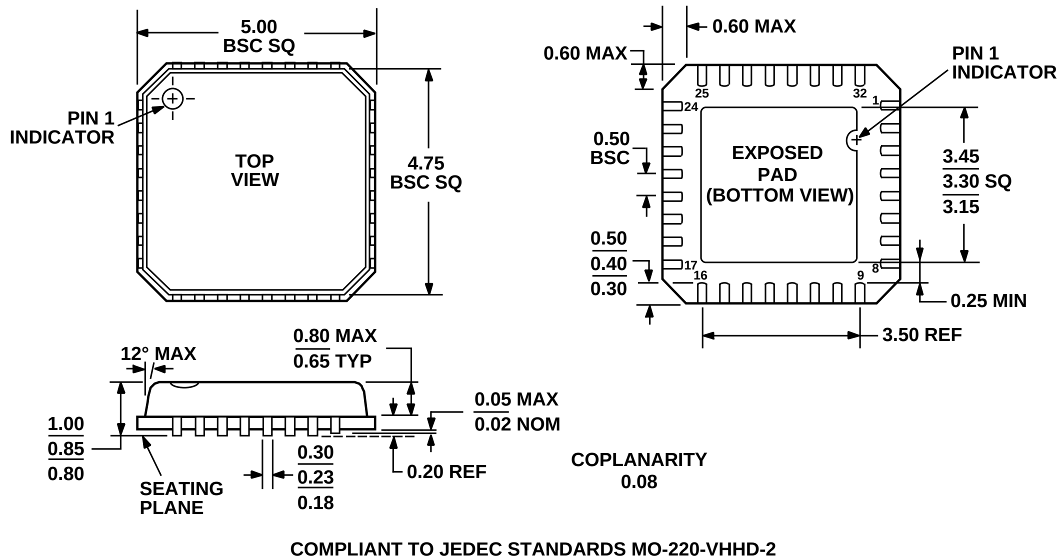

Figure 1. 32-Lead Lead Frame Chip Scale Package [LFCSP], 5 mm × 5 mm Body (CP-32-3)—Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD8143ACPZ-R2[1]	–40°C to +85°C	32-Lead Lead Frame Chip Scale Package (LFCSP)	CP-32-3
AD8143ACPZ-RL[1]	–40°C to +85°C	32-Lead Lead Frame Chip Scale Package (LFCSP)	CP-32-3
AD8143ACPZ-RL7[1]	–40°C to +85°C	32-Lead Lead Frame Chip Scale Package (LFCSP)	CP-32-3

[1] Z = Pb-free part.