6-Channel, Muxed Input Line Inversion LCD Gamma Buffers

Data Sheet **ADD8506**

FEATURES

Single-supply operation: 3.3 V to 6.5 V
Rail-to-rail input, rail-to-rail output
High output short-circuit current: 380 mA
Low supply current: 3.9 mA
Wide temperature range: −40°C to +105°C
Pb-free, 24-lead TSSOP package

APPLICATIONS

Liquid crystal display (LCD) line inversion gamma references
Personal media player panels

PIN CONNECTION DIAGRAM

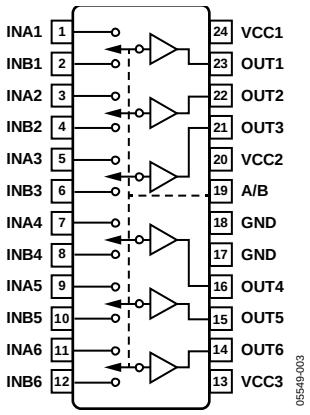

Figure 1.

GENERAL DESCRIPTION

The ADD8506 is a 6-channel LCD gamma reference buffer designed to drive column driver gamma inputs in line inversion panels. Each buffer channel has an INAx and an INBx input to select between two gamma voltage curves. These buffer channels drive the resistor ladders of LCD column drivers for gamma correction. The ADD8506 outputs have high slew rates and output drives that increase the stability of the reference ladder, resulting in optimal gray scale and visual performance.

The ADD8506 is specified over the −40°C to +105°C temperature range. It is available in a surface-mount, Pb-free, 24-lead thin shrink small outline package (TSSOP).

Rev. E **Document Feedback**

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REVISION HISTORY

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10/2005—Rev. 0 to Rev. A

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9/2005—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Supply voltage (V_{CC}) = 5 V, T_A = 25°C, unless otherwise noted. V_{IN} denotes buffer input voltage, I_{LOAD} denotes load current, R_L denotes load resistance, and C_L denotes load capacitance.

Table 1.

Parameter	Symbol	Test Conditions/Comments	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	0 V ≤ V_{IN} ≤ 5 V			20	mV
Input Common-Mode Voltage Range	V_{CM}		0		5	V
Input Bias Current	I_B	V_{IN} = 2.5 V		2	50	nA
Voltage Gain	A_{VO}		0.985			V/V
OUTPUT CHARACTERISTICS						
Output Voltage						
High	V_{OH}	I_{LOAD} = 20 mA	4.75			V
Low	V_{OL}	I_{LOAD} = −20 mA			0.2	V
Output Resistance	R_{OUT}	−20 mA ≤ I_{LOAD} ≤ +20 mA; 0.5 V ≤ V_{IN} ≤ 4.5 V		0.20		Ω
Output Short-Circuit Current	I_{SC}		120	380		mA
POWER SUPPLY						
Supply Current	I_{SY}	V_{IN} = 2.5 V		3.9	5.1	mA
Supply Voltage Range	V_{CC}		3.3		6.5	V
DYNAMIC PERFORMANCE						
Slew Rate	SR	C_L = 15 pF		7.0		V/µs
		R_L = 250 Ω		6.2		V/µs
Settling Time	t_S	C_L = 200 pF, R_L = 10 kΩ		2.5	6	µs
LOGIC INPUT CHARACTERISTICS						
Input Current						
Low	I_{IL}	V_{IN} = 0 V			100	nA
High	I_{IH}	V_{IN} = 5.0 V			100	nA
Input Voltage						
Low	V_{IL}	V_{CC} = 5 V, −40°C ≤ T_A ≤ +105°C			0.8	V
		V_{CC} = 3.3 V, −40°C ≤ T_A ≤ +105°C			0.7	V
High	V_{IH}	V_{CC} = 5 V, −40°C ≤ T_A ≤ +105°C	1.7			V
		V_{CC} = 3.3 V, −40°C ≤ T_A ≤ +105°C	1.4			V

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage, V_{CC}	7 V
Input Voltage, V_{IN}	GND to V_{CC}
Storage Temperature Range	−65°C to +150°C
Junction Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 60 sec)	300°C
ESD Performance	
Human Body Model	3.5 kV
Machine Model	200 V
Field Induced Charge Device Model	1.0 kV

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

THERMAL RESISTANCE

Thermal performance is directly linked to printed circuit board (PCB) design and operating environment. Careful attention to PCB thermal design is required.

θ_{JA} is the natural convection junction to ambient thermal resistance measured in a one cubic foot sealed enclosure. θ_{JC} is the junction to case thermal resistance.

Table 3. Thermal Package Characteristics

Package Type[1]	θ_{JA}	θ_{JC}	Unit
RU-24	128	45	°C/W

[1] θ_{JA} and θ_{JC} are specified for natural convection on a 2-layer board.

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.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

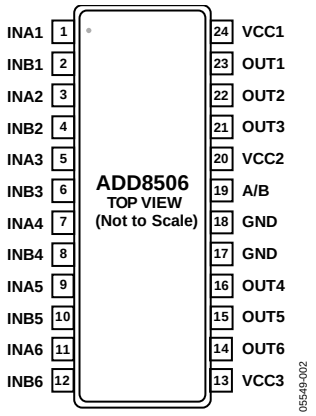

Figure 2. Pin Configuration

Table 4. Pin Function Descriptions

Pin No.	Mnemonic	Function	Description
1	INA1	Input	Channel 1 Buffer Input A.
2	INB1	Input	Channel 1 Buffer Input B.
3	INA2	Input	Channel 2 Buffer Input A.
4	INB2	Input	Channel 2 Buffer Input B.
5	INA3	Input	Channel 3 Buffer Input A.
6	INB3	Input	Channel 3 Buffer Input B.
7	INA4	Input	Channel 4 Buffer Input A.
8	INB4	Input	Channel 4 Buffer Input B.
9	INA5	Input	Channel 5 Buffer Input A.
10	INB5	Input	Channel 5 Buffer Input B.
11	INA6	Input	Channel 6 Buffer Input A.
12	INB6	Input	Channel 6 Buffer Input B.
13	VCC3	Power input	Power Supply Input 3. Short this pin to VCC1 and VCC2. This pin is typically connected to 5 V.
14	OUT6	Output	Channel 6 Buffer Output.
15	OUT5	Output	Channel 5 Buffer Output.
16	OUT4	Output	Channel 4 Buffer Output.
17, 18	GND	Ground	Ground.
19	A/B	Input	Switch Control. A logic high selects Input A, and a logic low selects Input B.
20	VCC2	Power input	Power Supply Input 2. Short this pin to VCC1 and VCC3. This pin is typically connected to 5 V.
21	OUT3	Output	Channel 3 Buffer Output.
22	OUT2	Output	Channel 2 Buffer Output.
23	OUT1	Output	Channel 1 Buffer Output.
24	VCC1	Power input	Power Supply Input 1. Short this pin to VCC2 and VCC3. This pin is typically connected to 5 V.

TYPICAL PERFORMANCE CHARACTERISTICS

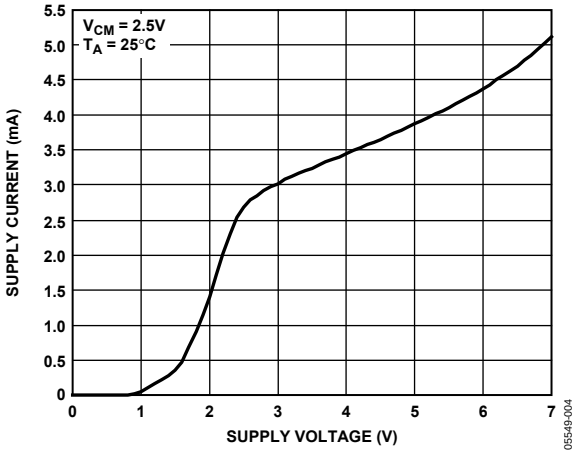

Figure 3. Supply Current vs. Supply Voltage

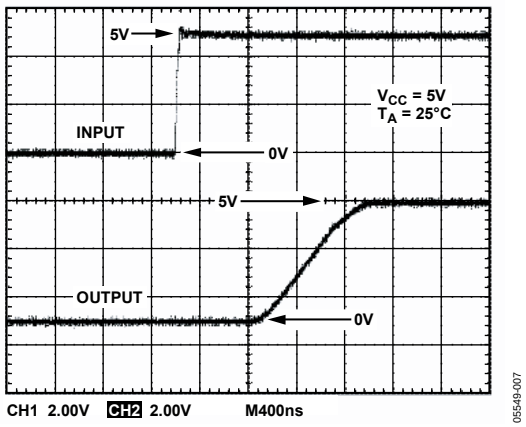

Figure 6. Transient Response—Rising

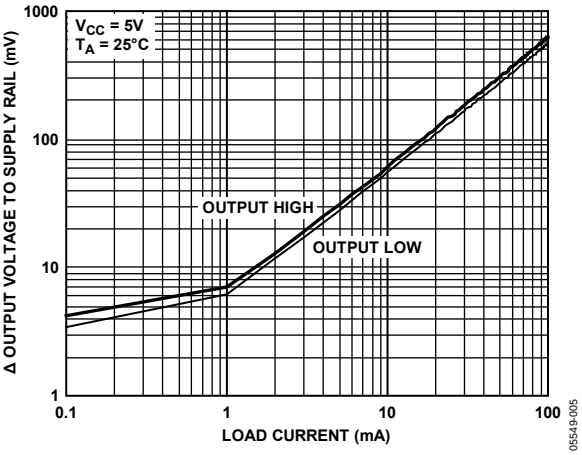

Figure 4. Δ Output Voltage to Supply Rail vs. Load Current

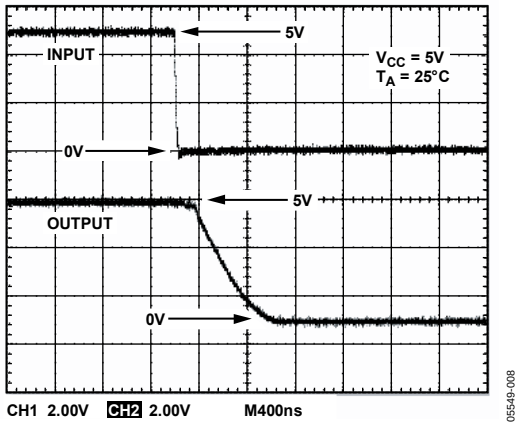

Figure 7. Transient Response—Falling

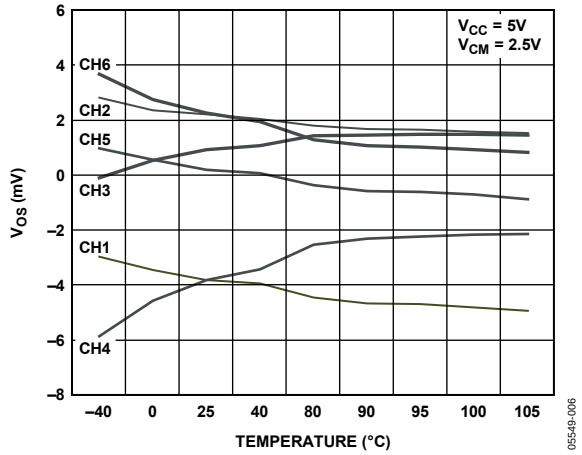

Figure 5. V_{OS} vs. Temperature

THEORY OF OPERATION

The ADD8506 is a 6-channel LCD gamma reference buffer designed to drive column driver gamma inputs in line inversion panels. Each buffer channel has an INAx/INBx input to select between two gamma voltage curves. These buffer channels drive the resistor ladders of LCD column drivers for gamma correction. The ADD8506 outputs have high slew rates and output drives that increase the stability of the reference ladder resulting in optimal gray scale and visual performance.

The ADD8506 is stable with capacitive loads. The ADD8506 can support loads up to 1 nF.

APPLICATIONS INFORMATION

The ADD8506 has CMOS buffers with INAx and INBx inputs to select between two different reference voltages set up by an external resistor ladder. The low input bias current allows the use of a very large resistor ladder to save supply current.

The buffer outputs are designed to drive resistive or capacitive loads. Therefore, to attain the best display performance, do not use resistors in series with these outputs. The outputs have high slew rates and 6 µs (maximum) settling times. Each output delivers a minimum of 120 mA, ensuring a fast response to varying loads.

The power supply pins on the ADD8506 have multiple ground (GND) and supply (VCCx) connections. Because of the high peak currents that these buffers deliver, it is recommended that all GND and VCCx pins be connected and suitably bypassed.

Table 5. Mux Function

A/B Select	Input
Logic High	INAx
Logic Low	INBx

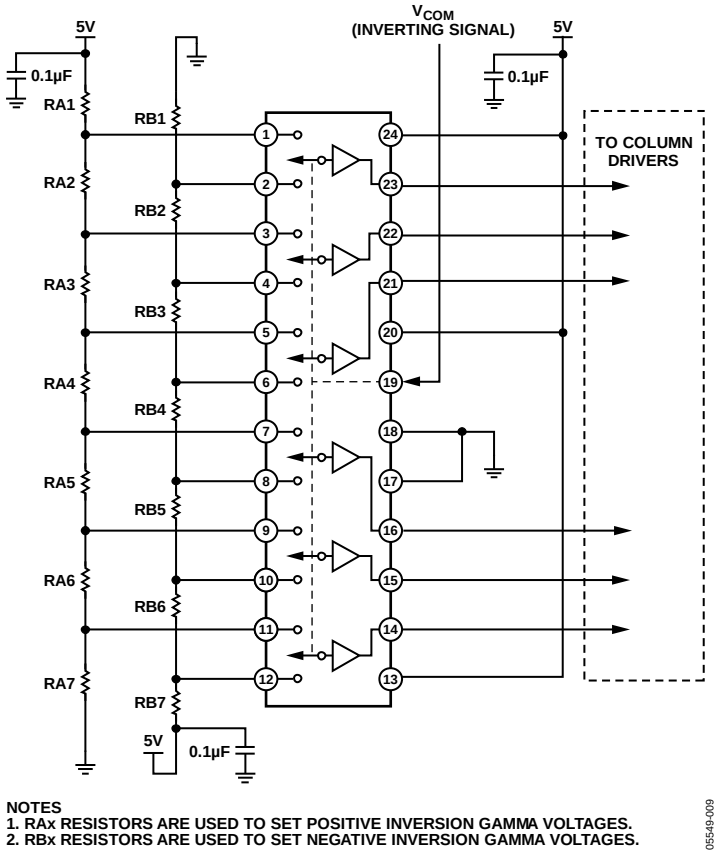

Figure 8. Typical Application

OUTLINE DIMENSIONS

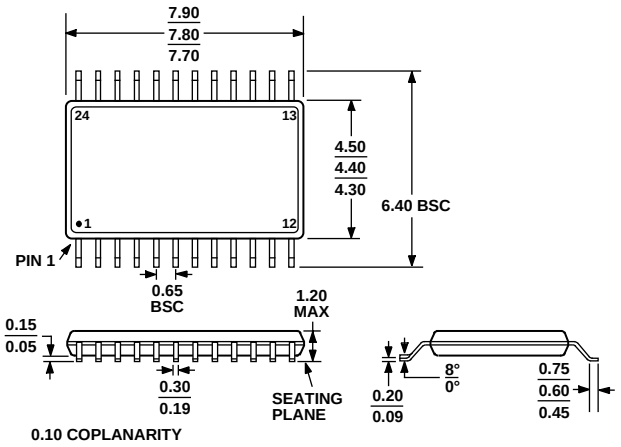

Figure 9. 24-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-24)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option	Ordering Quantity
ADD8506WRUZ	−40°C to +105°C	24-Lead Thin Shrink Small Outline Package [TSSOP], Tube	RU-24	62
ADD8506WRUZ-REEL7	−40°C to +105°C	24-Lead Thin Shrink Small Outline Package [TSSOP], 7″ Tape and Reel	RU-24	1,000

[1] Z = RoHS Compliant Part.

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