BURR-BROWN®

ALD1000

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Precision Programmable CURRENT/VOLTAGE TRANSMITTER

FEATURES

- SWITCHABLE OUTPUT ±10V OR 4-20mA
- DRIVES 1000Ω || 1µF AT 20mA
- VOLTAGE AND CURRENT SENSE
- GROUND NOISE SUPPRESSION
- ERROR DETECTION FLAG
- OUTPUT DISABLE
- ACCURACY: 0.05% *max*
- WIDE SUPPLY RANGE: ±11V TO +24/–15V

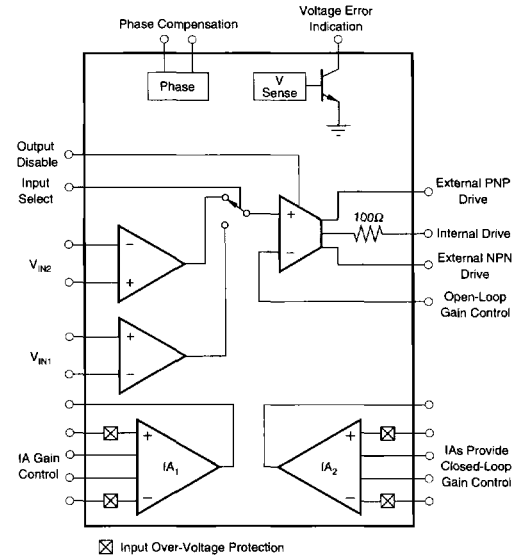
APPLICATIONS

- PROGRAMMABLE CONTROLLERS
- STANDARDIZED OUTPUTS FOR TERMINATION PANELS
- INDUSTRIAL PROCESS CONTROL
- PROGRAMMABLE CURRENT SOURCE
- MOTOR CONTROL SYSTEMS
- PC AND VME BASED INSTRUMENTATION
- CONDITIONER FOR STANDARD SENSOR OUTPUTS
- TEST EQUIPMENT PIN DRIVER

DESCRIPTION

This product is a monolithic programmable voltage-to-current or voltage-to-voltage analog line driver circuit. It can convert a ±10V input into either an output voltage or current with remote sensing. It provides drive for external transistors to boost output current to greater than ±25mA levels.

Current and voltage sensing can be performed simultaneously. Current sensing is achieved through a single external sense resistor. Voltage sensing is performed directly across the load. The logic inputs provide for both output disable and switching between constant current or constant voltage output functions. An open collector output provides an error flag for open circuit loads. The output disable function allows full control of the output even during power-on and power-off sequencing. The instrumentation amplifiers are designed to insure that load noise is not circulated within the control loop.



International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111 • Twx: 910-952-1111
Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS

At $+V_S$ = 24V, $-V_S$ = 15V, T_{AMB} = 25°C, and 2N2222, 2N2907 external transistors, unless otherwise noted.

PARAMETER	CONDITIONS	ALD1000U MIN	ALD1000U TYP	ALD1000U MAX	UNITS
TRANSMITTER					
SWOP INPUTS					
Linear Range Min	Internal Drive Transistors			−10	V
Linear Range Max	5mA Load	10			V
Input Bias Current			50		pA
XTR OUTPUT					
Positive Overvoltage Sense			19.5		V
Negative Overvoltage Sense	Internal Drive Transistors		−10.5		V
Positive Overcurrent Sense			+25		mA
Negative Overcurrent Sense			−15		mA
LOGIC INPUTS					
Logic Low				0.8	V
Logic High		4.0	2.6		V
LOGIC OUTPUTS					
Logic High	5V Logic Supply	4.0			V
Logic Low	with 10k pull-up resistor			0.8	V
OUTPUT—VOLTAGE MODE (Gain = 1 unless otherwise specified)					
Span Error			0.5	1	%
Span Drift			50		ppm/°C of FS
Linear Range Min	0.1% of FS			−10	
Linear Range Max	0.1% of FS	10			
Output Current Min	Internal Drive Transistors			−5	mA
Output Current Max	Internal Drive Transistors	5			mA
Short-Circuit Current	Internal Drive Transistors		25		mA
Short-Circuit Current	Internal Drive Transistors		−15		mA
Non-Linearity			0.005	0.05	%
Initial Offset Voltage—RTI			2		mV
Offset Voltage vs Temperature			20		µV/°C
OUTPUT—CURRENT MODE (Gain = 5 with 50Ω shunt resistor unless otherwise specified)					
Span Error			5		%
Span Drift	Gain = 1[1]		50		ppm/°C of FS
Output Current Min	Internal Drive Transistors[2]			−5	mA
Output Current Max	Internal Drive Transistors[2]	5			mA
Compliance Min		−10			V
Compliance Max				15	V
Offset Current Min				−25	µA
Offset Current Min		25			µA
INSTRUMENTATION AMPLIFIERS R_{LOAD} = 10k					
IA INPUTS					
Linear Input Voltage Min				−10	V
Linear Input Voltage Max		20			V
Common-Mode Input Voltage Min	V_{IN} = 0			−10	V
Common-Mode Input Voltage Max	V_{IN} = 0	20			V
Input Bias Current			100		nA
Initial Offset Voltage	G = 1	−1		1	mV
CMRR	G = 10	80	100		
IA OUTPUTS (with 10k Load)					
Output Voltage Max		20			V
Output Voltage Min				−10	V
+ Short Circuit Current			5		mA
− Short Circuit Current			−12		mA
GAIN EQUATION (gain = 1+50k/R_G)					
Gain Error, G = 1				0.3	%±FS
G = 5				0.6	%±FS
G = 100				0.8	%±FS
Non-Linearity, G = 1				0.004	%±FS
G = 5				0.008	%±FS
G = 100				0.02	%±FS

SPECIFICATIONS (CONT)

At $+V_S$ = 24V, $-V_S$ = 15V, T_{AMB} = 25°C, and 2N2222, 2N2907 external transistors, unless otherwise noted.

PARAMETER	CONDITIONS	ALD1000U MIN	ALD1000U TYP	ALD1000U MAX	UNITS
FREQUENCY RESPONSE					
G = 1			700		kHz
G = 5			400		kHz
G = 100			50		kHz
Slew Rate	V_O = ±10V, G = 10		4		V/µS
SETTLING TIME, 0.01%					
G = 1			20		µS
G = 5			20		µS
G = 100			30		µS
POWER SUPPLY					
Quiescent Current	Internal Drive Transistors		5		mA
TEMPERATURE RANGE					
Operating		–40		+85	°C
Storage		–65		+150	°C

NOTES: (1) Gain drift depends on tempco of 50K factor on gain equation when gain is greater than 1. (2) External Drive capacity varies with configuration. See Application Note.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (±V_S)	+25V, –18V
IA Inputs	±40V
SWOP Inputs	±V_S
Logic Inputs	+V_S, –V_S + 0.5V
Junction Temperature	150°C
Storage Temperature	–65°C to +150°C
Lead Temperature (soldering, 10s)	*+300°C*
Output Short-to-Ground at 25°C	Continuous

PACKAGE/ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER(1)
ALD1000U	28-Pin SOIC	217

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book.

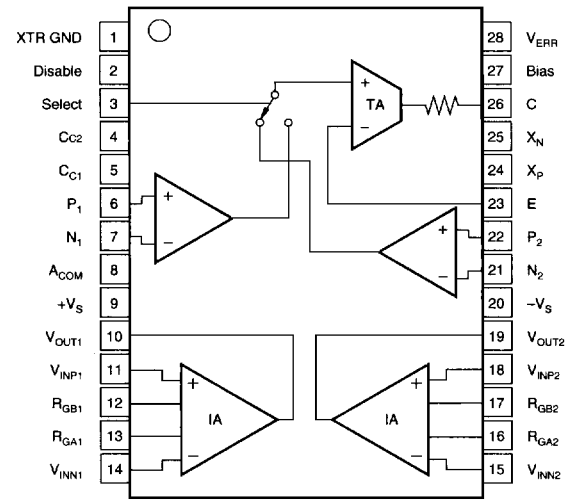
ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

PIN CONFIGURATION

Top View **28-Lead SOIC**



PIN ASSIGNMENTS

PIN #	NAME	DESCRIPTION
1	XTR GND	Power ground pin.
2	Disable	A 5V signal puts the internal drive in a high impedance state and limits the external drive capacity.
3	Select	Selects the SWOP amp input. A 5V signal selects inputs N1 and P1.
4	C_{C2}	C_{C1} and C_{C2} are for the external compensation capacitor.
5	C_{C1}	C_{C1} and C_{C2} are for the external compensation capacitor.
6	P_1	Non-inverting input to the XTR SWOP amp 1.
7	N_1	Inverting input to the XTR SWOP amp 1.
8	A_{COM}	Signal ground for the instrumentation amplifiers.
9	$+V_S$	Positive power supply voltage.
10	V_{OUT1}	Output of the instrumentation amplifier 1.
11	V_{INP1}	Non-inverting input to instrumentation amplifier 1.
12	R_{GB1}	Gain set resistor for instrumentation amplifier 1.
13	R_{GA1}	Gain set resistor for instrumentation amplifier 1.
14	V_{INN1}	Inverting input of instrumentation amplifier 1.
15	V_{INN2}	Inverting input of instrumentation amplifier 2.
16	R_{GA2}	Gain set resistor for instrumentation amplifier 2.
17	R_{GB2}	Gain set resistor for instrumentation amplifier 2.
18	V_{INP2}	Non-inverting input to instrumentation amplifier 2.
19	V_{OUT2}	Output of the instrumentation amplifier 2.
20	$-V_S$	Negative power supply voltage.
21	N_2	Inverting input to the XTR SWOP amp 2.
22	P_2	Non-inverting input to the XTR SWOP amp 2.
23	E	Inverting input (emitter) of the output transconductance amplifier.
24	X_P	Base drive for an external, PNP, driver transistor (optional).
25	X_N	Base drive for an external, NPN, driver transistor (optional).
26	C	Output (collector) of the output transconductance amplifier.
27	Bias	Open collector output indicating an internal overcurrent condition.
28	V_{ERR}	Open collector output indicating an overvoltage condition.