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ALD1000

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Precision Programmable CURRENT/VOLTAGE TRANSMITTER

FEATURES

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

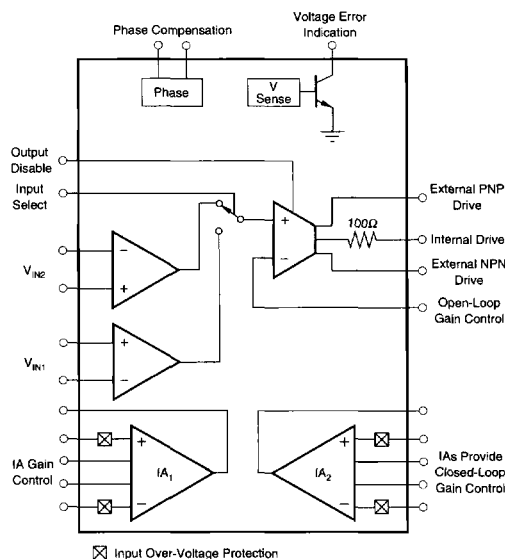
APPLICATIONS

- 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 $\pm 10V$ input into either an output voltage or current with remote sensing. It provides drive for external transistors to boost output current to greater than $\pm 25mA$ 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.



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SPECIFICATIONS

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

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

ALD1000

4

INSTRUMENTATION AMPLIFIERS

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SPECIFICATIONS (CONT)

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

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

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 ($\pm V_S$)	+25V, -18V
IA Inputs	$\pm 40V$
SWOP Inputs	$\pm V_S$
Logic Inputs	$+V_S$, $-V_S + 0.5V$
Junction Temperature	150 $^\circ C$
Storage Temperature	-65 $^\circ C$ to +150 $^\circ C$
Lead Temperature (soldering, 10s)	+300 $^\circ C$
Output Short-to-Ground at 25 $^\circ C$	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

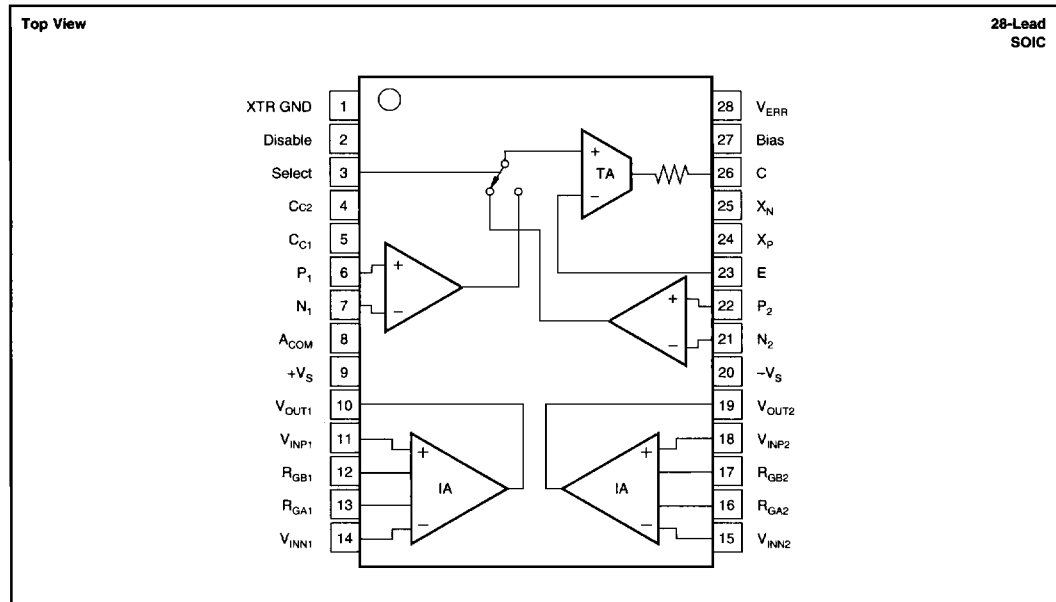
This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

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.

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PIN CONFIGURATION



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	CC2	CC1 and CC2 are for the external compensation capacitor.
5	CC1	CC1 and CC2 are for the external compensation capacitor.
6	P1	Non-inverting input to the XTR SWOP amp 1.
7	N1	Inverting input to the XTR SWOP amp 1.
8	ACOM	Signal ground for the instrumentation amplifiers.
9	+VS	Positive power supply voltage.
10	VOUT1	Output of the instrumentation amplifier 1.
11	VINP1	Non-inverting input to instrumentation amplifier 1.
12	RGB1	Gain set resistor for instrumentation amplifier 1.
13	RGA1	Gain set resistor for instrumentation amplifier 1.
14	VINN1	Inverting input of instrumentation amplifier 1.
15	VINN2	Inverting input of instrumentation amplifier 2.
16	RGA2	Gain set resistor for instrumentation amplifier 2.
17	RGB2	Gain set resistor for instrumentation amplifier 2.
18	VINP2	Non-inverting input to instrumentation amplifier 2.
19	VOUT2	Output of the instrumentation amplifier 2.
20	-VS	Negative power supply voltage.
21	N2	Inverting input to the XTR SWOP amp 2.
22	P2	Non-inverting input to the XTR SWOP amp 2.
23	E	Inverting input (emitter) of the output transconductance amplifier.
24	XP	Base drive for an external, PNP, driver transistor (optional).
25	XN	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	VERR	Open collector output indicating an overvoltage condition.

ALD1000

4

INSTRUMENTATION AMPLIFIERS