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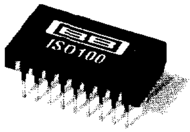


ISO100

www.burr-brown.com/databook/ISO100.html

Optically-Coupled Linear ISOLATION AMPLIFIER

FEATURES

- EASY TO USE, SIMILAR TO AN OP AMP
  $V_{OUT}/I_{IN} = R_F$, Current Input
  $V_{OUT}/V_{IN} = R_F/R_{IN}$, Voltage Input
- 100% TESTED FOR BREAKDOWN: 750V Continuous Isolation Voltage
- ULTRA-LOW LEAKAGE: 0.3µA, max, at 240V/60Hz
- WIDE BANDWIDTH: 60kHz
- 18-PIN DIP PACKAGE

APPLICATIONS

- INDUSTRIAL PROCESS CONTROL
  Transducer Sensing
  (Thermocouples, RTD, Pressure Bridges)
  4mA to 20mA Loops
  Motor and SCR Control
  Ground Loop Elimination
- BIOMEDICAL MEASUREMENTS
- TEST EQUIPMENT
- DATA ACQUISITION

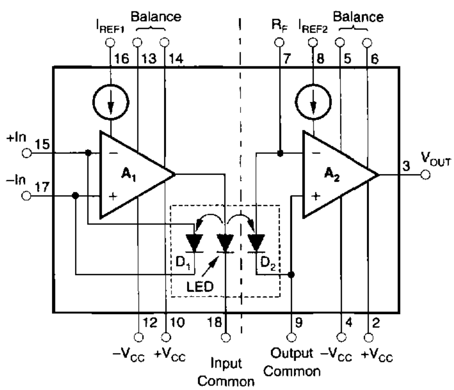
DESCRIPTION

The ISO100 is an optically-coupled isolation amplifier. High accuracy, linearity, and time-temperature stability are achieved by coupling light from an LED back to the input (negative feedback) as well as forward to the output. Optical components are carefully matched and the amplifier is actively laser-trimmed to assure excellent tracking and low offset errors.

The circuit acts as a current-to-voltage converter with a minimum of 750V (2500V test) between input and output terminals. It also effectively breaks the galvanic connection between input and output commons as indicated by the ultra-low 60Hz leakage current of 0.3µA at 250V. Voltage input operation is easily achieved by using one external resistor.

Versatility along with outstanding DC and AC performance provide excellent solutions to a variety of challenging isolation problems. For example, the ISO100 is capable of operating in many modes, including: noninverting (unipolar and bipolar) and inverting (unipolar and bipolar) configurations. Two precision current sources are provided to accomplish bipolar operation. Since these are not required for unipolar operation, they are available for external use (see Applications section).

Designs using the ISO100 are easily accomplished with relatively few external components. Since V_{OUT} of the ISO100 is simply $I_{IN}R_F$, gains can be changed by altering one resistor value. In addition, the ISO100 has sufficient bandwidth (DC to 60kHz) to amplify most industrial and test equipment signals.



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SPECIFICATIONS

ELECTRICAL

At T_A = +25°C and $\pm V_{CC}$ = 15VDC, unless otherwise specified.

PARAMETER	CONDITIONS	ISO100AP			ISO100BP			ISO100CP			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
ISOLATION											
Voltage											
Rated Continuous, AC peak or DC[1]		750			*			*			V
Test Breakdown, DC	10s	2500			*			*			V
Rejection[2] DC			5			*			*		pA/V
	R_{IN} = 10kΩ, Gain = 100		146			*			*		dB
AC	60Hz, 480V, R_F = 1MΩ		400			*			*		pA/V
	R_{IN} = 10kΩ, Gain = 100		108			*			*		dB
Impedance			10^{12}∥2.5			*			*		Ω∥pF
Leakage Current	240Vrms, 60Hz			0.3			*			*	μA, rms
OFFSET VOLTAGE (RTI)											
Input Stage (V_{OSI})											
Initial Offset				500			300			200	μV
vs Temperature				5			2			2	μV/°C
vs Input Power Supplies				105			*			*	dB
vs Time			1			*			*		μV/kHr
Output Stage (V_{OSO})											
Initial Offset				500			300			200	μV
vs Temperature				5			2			2	μV/°C
vs Output Power Supplies				105			*			*	dB
vs Time			1			*			*		μV/kHr
Common-Mode Rejection Ratio[2]	60Hz, R_F = 1MΩ		3			*			*		nA/V
	R_{IN} = 10kΩ, Gain = 100		90			*			*		dB
Common-Mode Range		±10			*			*			V
REFERENCE CURRENT SOURCES											
Magnitude											
Nominal		10.5	12	12.5	*	*	*	*	*	*	μA
vs Temperature				300			*			150	ppm/°C
vs Power Supplies			0.3	3		*	*		*	*	nA/V
Matching											
Nominal			50			*			*		nA
vs Temperature			150			*			*		ppm/°C
vs Power Supplies			0.3			*			*		nA/V
Compliance Voltage		−10		+15	*		*	*		*	V
Output Resistance			2×10^9			*			*		Ω
FREQUENCY RESPONSE											
Small Signal Bandwidth	Gain = 1V/μA		60			*			*		kHz
Full Power Bandwidth	Gain = 1V/μA, V_O = ±10V		5			*			*		kHz
Slew Rate		0.22	0.31		*	*		*	*		V/μs
Settling Time	0.1%		100			*			*		μs
TEMPERATURE RANGE											
Specification		−25		+85	*		*	*		*	°C
Operating		−40		+100	*		*	*		*	°C
Storage		−40		+100	*		*	*		*	°C
UNIPOLAR OPERATION											
GENERAL PARAMETERS											
Input Current Range											
Linear Operation		−20		−0.02	*		*	*		*	μA
Without Damage		−1		+1	*		*	*		*	mA
Input Impedance			0.1			*			*		Ω
Output Voltage Swing	R_L = 2kΩ, R_F = 1MΩ	−10		0	*		*	*		*	V
Output Impedance	DC, Open-Loop		1200			*			*		Ω
GAIN	$V_O = R_F (I_{IN})$										
Initial Error (adjustable to zero)			2	5		1	2		1	2	% of FS
vs Temperature			0.03	0.07		0.01	0.05		0.005	0.03	%/°C
vs Time			0.05			*			*		%/kHr
Nonlinearity[3]			0.1	0.4		0.03	0.1		0.02	0.07	%
CURRENT NOISE	I_{IN} = 0.2μA										
0.01Hz to 10Hz			20			*			*		pAp-p
10Hz			1			*			*		pA/√Hz
100Hz			0.7			*			*		pA/√Hz
1kHz			0.65			*			*		pA/√Hz

SPECIFICATIONS (CONT)

ELECTRICAL

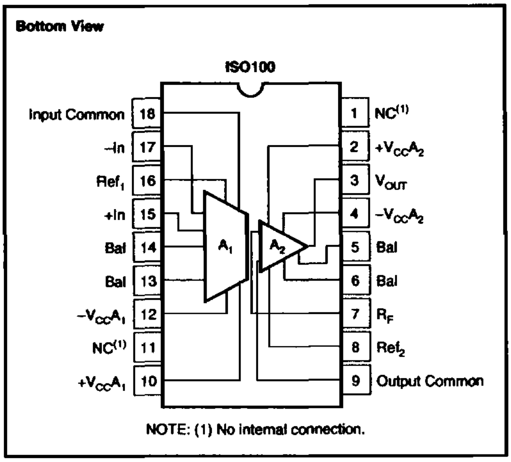
At T_A = +25°C and $\pm V_{CC}$ = 15VDC, unless otherwise specified.

PARAMETER	CONDITIONS	ISO100AP MIN	ISO100AP TYP	ISO100AP MAX	ISO100BP MIN	ISO100BP TYP	ISO100BP MAX	ISO100CP MIN	ISO100CP TYP	ISO100CP MAX	UNITS
INPUT OFFSET CURRENT (I_{OS})											
Initial Offset			1	10		*	*		*	*	nA
vs Temperature			0.05			*			*		nA/°C
vs Power Supplies			0.1			*			*		nA/V
vs Time			100			*			*		pA/kHr
POWER SUPPLIES											
Input Stage											
Voltage (rated performance)			±15			*			*		V
Voltage (derated performance)		±7		±18	*		*	*		*	V
Supply Current	I_{IN} = −0.02µA		±1.1	±2		*	*		*	*	mA
	I_{IN} = −20µA		+8, −1.1	+13, −2		*	*		*	*	mA
Output Stage											
Voltage (rated performance)			±15			*			*		V
Voltage (derated performance)		±7		±18	*		*	*		*	V
Supply Current	V_O = 0		±1.1	±2		*	*		*	*	mA
Short Circuit Current Limit				±40			*			*	mA
BIPOLAR OPERATION											
GENERAL PARAMETERS											
Input Current Range											
Linear Operation		−10		+10	*		*	*		*	µA
Without Damage		−1		+1	*		*	*		*	mA
Input Impedance			0.1			*			*		Ω
Output Voltage Swing	R_L = 2kΩ, R_F = 1MΩ	−10		+10	*		*	*		*	V
Output Impedance			1200			*			*		Ω
GAIN	$V_O = R_F (I_{IN})$										
Initial Error (Adjustable To Zero)			2	5		1	2		1	2	% of FS
vs Temperature			0.03	0.07		0.01	0.05		0.005	0.03	%/°C
vs Time			0.05			*			*		%/kHr
Nonlinearity(3)			0.1	0.4		0.03	0.1		0.02	0.07	%
CURRENT NOISE	I_{IN} = 0.2µA										
0.01Hz to 10Hz			1.5			*			*		nA, p-p
10Hz			17			*			*		pA/√Hz
100Hz			7			*			*		pA/√Hz
1kHz			6			*			*		pA/√Hz
INPUT OFFSET CURRENT (I_{OS}, bipolar(4))											
Initial Offset			40	200		20	70		10	35	nA
vs Temperature				3			2			1	nA/°C
vs Power Supplies				0.7			*			*	nA/V
vs Time			250			*			*		pA/kHr
POWER SUPPLIES											
Input Stage											
Voltage (rated performance)			±15			*			*		V
Voltage (derated performance)		±7		±18	*		*	*		*	V
Supply Current	I_{IN} = +10µA		+2, −1.1	+3, −2		*	*		*	*	mA
	I_{IN} = −10µA		+8, −1.1	+13, −2		*	*		*	*	mA
Output Stage											
Voltage (rated performance)			±15			*			*		V
Voltage (derated performance)		±7		±18	*		*	*		*	V
Supply Current	V_O = 0		±1.1	±2		*	*		*	*	mA
Short Circuit Current Limit				±40			*			*	mA

* Specification same as ISO100AP.

NOTES: (1) See Typical Performance Curves for temperature effects. (2) See Theory of Operation section for definitions. For dB see Ex. 2, CM and HV errors. (3) Nonlinearity is the peak deviation from a "best fit" straight line expressed as a percent of full scale output. (4) Bipolar offset current includes effects of reference current mismatch and unipolar offset current.

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

Supply Voltages	±18V
Isolation Voltage, AC pk or DC	750V
Input Current	±1mA
Storage Temperature Range	–40°C to +100°C
Lead Temperature (soldering, 10s)	+300°C
Output Short-Circuit Duration	Continuous to Ground

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.

PACKAGE/ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER[1]	TEMPERATURE RANGE
ISO100AP	18-Pin Bottom-Braze DIP	220	–25°C to +85°C
ISO100BP	18-Pin Bottom-Braze DIP	220	–25°C to +85°C
ISO100CP	18-Pin Bottom-Braze DIP	220	–25°C to +85°C

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