



3450
3451
3452
3455

Precision Linear ISOLATION AMPLIFIERS

FEATURES

- 2000V ISOLATION (3452)
- 160dB ISOLATION-MODE REJECTION
- DIFFERENTIAL INPUT
- 0.005% GUARANTEED GAIN LINEARITY (3450)
- $1\mu\text{V}/^\circ\text{C}$ INPUT VOLTAGE DRIFT (3450)
- 20pA INPUT BIAS CURRENT (3452)
- PRECISION WIRE-WOUND RESISTORS FOR LONG TERM STABILITY
- LOW INTERFERENCE PICKUP - PW MODULATION

DESCRIPTION

The models 3450, 3451, and 3452 are operational amplifiers with the unique feature of having the output completely isolated from the input. This is accomplished by a high accuracy modulation demodulation stage which isolates the input from the output by $10^{12}\Omega$ in parallel with 12pF of coupling capacitance and provides gain linearity and stability far superior to that offered by ordinary isolation amplifiers.

These devices differ from other isolation amplifiers in several respects. They are true differential input operational amplifiers whereas other commercially available isolation amplifiers are simple unity-gain isolators or are capable of a few fixed gains. Thus

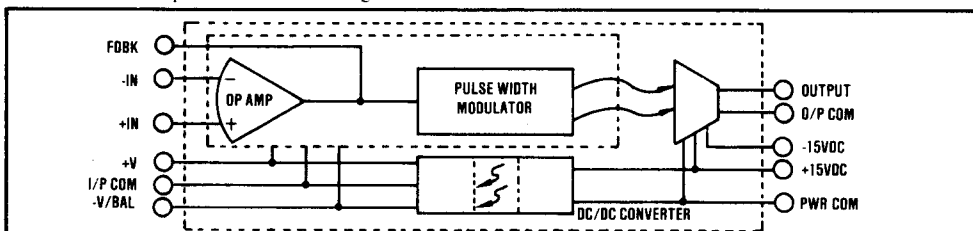
APPLICATIONS

- GROUND-LOOP ELIMINATION
- OFF-GROUND SIGNAL MEASUREMENTS
- MEDICAL INSTRUMENTATION
- PATIENT MONITORING
- INDUSTRIAL PROCESS CONTROL
- DATA ACQUISITION
- HIGH VOLTAGE MEASUREMENTS
- FAULT PROTECTION

they can be connected in all of the common op amp feedback circuits such as summing, inverting, differentiating, etc.

The 3452 differs from the 3450 and 3451 in that it has higher isolation voltage (2000V vs 500V) and has isolated $\pm 15\text{VDC}$ power available at the input.

The 3450 and 3451 differ from each other primarily in their input stage characteristics. The 3450 has a low drift ($1\mu\text{V}/^\circ\text{C}$) bipolar transistor input stage while the 3451 has a low bias current (25pA) FET transistor input stage. The 3455 is identical to the 3452 except for additional isolation specifications more well suited for medical applications.



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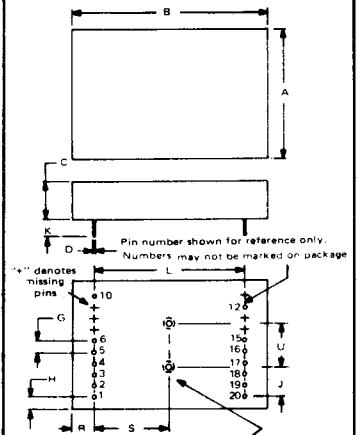
SPECIFICATIONS

ELECTRICAL

Typical at 25°C and ±15VDC unless otherwise noted.

MODEL	3450	3451	3452/3455 ⁽¹⁾	UNITS
INPUT⁽²⁾				
Open-Loop Gain, min	94	88	94	dB
Input Offset Voltage at 25°C ⁽³⁾ ; max vs Temperature, max vs Supply vs Time	±0.55 ±1.0 ±50 ±10	±20 ±50 ±50 ±100	±0.30 ±5.0 ±25	mV μV/°C μV/V μV/mo
Input Bias Current at 25°C, max vs Temperature, max vs Supply	±50 ±0.5 ±0.2	-0.025 doubles/10°C ±0.001	-0.02	nA nA/°C nA/V
Input Offset Current at 25°C vs Temperature max vs Supply	±30, max ±0.3 ±0.1	±0.002 doubles/10°C ±0.0005		nA nA/°C nA/V
Input Impedance				
Differential	10 ⁷	10 ¹¹		Ω
Common-mode ⁽⁴⁾	5 x 10 ⁹ 10	10 ¹¹ 10		Ω pF
Input Noise				
Voltage, 0.01Hz to 10Hz	0.8	2	4	μV, p-p
10Hz to 1kHz	1.2	3	2	μV, rms
Current, 0.01Hz to 10Hz	30	0.3	0.3	pA, p-p
10Hz to 1kHz	50	0.6	0.6	pA, rms
Input Voltage Range				
Common-mode ⁽⁴⁾ (operating), min		+10		V
Differential (w/o damage), min		±15		V
Common-mode Rejection ⁽⁴⁾ at 10V	100	80	90	dB
Isolated Power Available				
Voltage	--	--	±15 +0, -10%	V
Current, max	--	--	±10	mA
Ripple at 100kHz	--	--	100	mV, p-p
ISOLATION				
Gain (without trimming), max ⁽³⁾ 1V/V vs Temperature, max	±0.1 ±10	+0.5 ±50		% ppm/°C
Nonlinearity ⁽⁵⁾ at ±10V, max/typ	±0.005/±0.0015	±0.025/±0.005	±0.025/±0.005	%
Frequency Response, -3dB (see Fig. 9)	1.5	2.5		kHz
Settling Time				
to 0.01%		5		msec
to 0.1%		1		msec
Isolation Impedance ⁽⁶⁾		10 ¹² 16		Ω pF
Isolation Leakage Current at 240V/60Hz, max		2.5 ⁽⁶⁾		μA
Isolation-mode Rejection ⁽⁶⁾				
DC, min		160		dB
60Hz, min		120		dB
Isolation Voltage ⁽⁶⁾				
Rated, continuous, min	±500	±2000		V, pk
Test Voltage ⁽⁷⁾	±2000	±5000		V, pk ⁽¹¹⁾
OUTPUT				
Output Voltage, min		+10		V
Output Current, min		+5		mA
Output Impedance, DC		0.2		Ω
Output Noise				
0.01Hz to 10Hz		7		μV, p-p
10Hz to 1kHz		25		μV, rms
Output Offset Voltage at 25°C ⁽³⁾ ; max vs Temperature, max vs Supply vs Time	±2	±5 ±100 ±500 ±100	±5	mV μV/°C μV/V μV/mo
Input Power Requirements				
Voltage		±14 to +16		VDC
Current, quiescent, max		+30/-5		mA
Current, full load, max		+35/-10	+55/-10	mA ⁽⁸⁾
TEMPERATURE RANGE				
Specification		-25 to +85		°C
Storage		-55 to +125		°C
Operating		-25 to +85		°C

MECHANICAL



4 40 thread, .10" (2.54mm) min, depth, 2 places in true position within .015" (.38mm) R @ MMC

NOTE:
Leads in true position within .015" (.38mm) R @ MMC at seating plane.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	2.250	2.310	57.15	58.67
B	3.480	3.510	87.63	89.15
C	.650	.710	16.51	18.03
D	.038	.042	0.97	1.07
G	200 BASIC		5.08 BASIC	
H	.200	.300	5.08	7.62
J	525 BASIC		13.34 BASIC	
K	.170	.350	4.32	8.89
L	2 700 BASIC		68.58 BASIC	
R	.350	.450	8.89	11.43
S	1 350 BASIC		34.29 BASIC	
U	750 BASIC		19.05 BASIC	

MATERIAL: Black Plastic
WEIGHT: 100g (3.5 oz.)
MATING CONNECTOR: 4400MC

NOTES:

- The 3455 is identical to the 3452 except for two additional specifications. Each unit is tested to withstand a 2500V, rms, 60Hz sine wave isolation voltage (Ref. Dielectric Withstand Voltage, paragraph 31.11 of UL544). Each unit is specified at a maximum leakage current of 2μA with 240V, rms, 60Hz isolation voltage (Ref. Leakage Current, paragraph 27.5 of UL544).
- For 3450 and 3451 current drawn from FDBK pin must be ≤ 5mA. For 3452 the sum of the current drawn from FDBK pin and either "-V/Bal" or "+V" pins (i.e., + or - isolated current) must be ≤ 11mA.
- Errors may be trimmed to zero.
- Common-mode parameters are measured at the +IN and -IN pins with respect to the I/P COM pin.
- Nonlinearity is specified to be the peak deviation from a best straightline expressed as a percent of peak-to-peak full scale output.
- Isolation-mode parameters are measured at the I/P COM pin with respect to the PWR COM pin and O/P COM pin.
- All units 100% tested for 1μA max leakage current at test voltage.
- Includes fully loaded input power.