SELECTION GUIDE

Part #	Description	Package	Status	Output Voltage vs. Power Supply	Bandwidth	Linearity	Max Common-Mode Voltage	Power Supply Current	Rise Time t_r
AD215AYATI (750V, SIP)	Upgraded replacement for AD210AY	SIP	**In production**	Isolated	300kHz	±0.005%	±13.5V	+30/−30mA	1µs
AD215AY	-	SIP	**Stop production**	Isolated	120kHz	±0.01%	±15V	+40/−18mA	3µs
AD215BYATI (1500V, SIP)	Upgraded replacement for AD210BY	SIP	**In production**	Isolated	300kHz	±0.005%	±13.5V	+30/−30mA	1µs
AD215BY	-	SIP	**Stop production**	Isolated	120kHz	±0.005%	±15V	+40/−18mA	3µs

Figure 1. Photo of AD215AYATI

Figure 2. Photo of AD215BYATI

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FEATURES

- Isolation Voltage Rating: 1500V rms
- Wide Bandwidth: 300kHz Full-Power (–3dB)
- Rapid Slew Rate: 2V/µs
- Fast Settling Time: 4µs
- Low Harmonic Distortion: –80dB @ 1kHz
- Low Nonlinearity: ±0.005%
- Wide Output Range: ±10 V, min (Buffered)
- Built-in Isolated Power Supply: ±15 VDC @ ±10mA
- Performance Rated over –40°C to +85°C

APPLICATIONS

- High Speed Data Acquisition Systems
- Power Line and Transient Monitors
- Multichannel Muxed Input Isolation
- Waveform Recording Instrumentation
- Power Supply Controls
- Vibration Analysis

Upgraded Drop-in Replacement for AD215

We guarantee production for ≥10 years.

DESCRIPTION

The AD215ATI is a high-speed input isolation amplifier designed to isolate and amplify wide-bandwidth analog signals. Its innovative circuit architecture and transformer design provide excellent wideband dynamic performance while preserving key DC performance specifications.

The AD215ATI offers complete galvanic isolation between the input and output stages, including user-accessible isolated front-end power supplies. Powered by a ±15V DC supply, this functionally complete design eliminates the need for an external isolated DC/DC converter. As a result, designers can minimize circuit overhead while reducing overall system complexity and component costs.

Designed for maximum flexibility and ease of use, the AD215ATI is ideal for applications requiring high-speed analog signal measurement in high common-mode voltage (CMV) environments. It features a ±10V input and output range, selectable gains from 1V/V to 10V/V, a buffered output with offset trim capability, and a user-available isolated front-end power supply that delivers ±15V DC at up to ±10mA.

PRODUCT HIGHLIGHTS

High-Speed Dynamic Performance: The AD215ATI delivers a typical full-power bandwidth of 300kHz (200kHz minimum), a fast 1µs rise time, and a 4µs settling time. This high-speed performance enables exceptional galvanic isolation and accurate reproduction of virtually any wideband dynamic analog signal.

Flexible Input and Buffered Output Stages: The AD215ATI includes an uncommitted operational amplifier at the input stage, allowing designers to implement input buffering, amplification, or custom signal conditioning as required. A buffered output stage is also provided to drive low-impedance loads, along with an output voltage trim to zero output offset when necessary.

High Accuracy: The AD215ATI achieves a typical nonlinearity of ±0.005% of full-scale range (B grade) and a total harmonic distortion of –80dB at 1kHz. This high level of accuracy ensures complete galvanic isolation of the desired signal without compromising signal integrity or quality.

Excellent Common-Mode Performance: The AD215BYATI (AD215AYATI) provides common-mode voltage protection of 1500V rms (750V rms) from input to output. Both grades feature a low common-mode capacitance of 4.5pF, inclusive of the isolated power supply. This results in a typical common-mode rejection of 105dB and a low leakage current of 2.0µA rms maximum at 240V rms, 60Hz.

Isolated Power Supply: An unregulated isolated power supply of ±15V DC at ±10mA is available at the AD215ATI's isolated input port. This allows the use of auxiliary isolated front-end amplifiers or signal-conditioning circuitry without the need for an external DC/DC converter. In many applications, transducer excitation can also be supported.

Rated Performance Over the –40°C to +85°C Temperature Range: With an extended industrial temperature rating, the AD215ATI is well suited for reliable operation in demanding industrial environments.

INSIDE THE AD215ATI

The AD215ATI is a fully self-contained analog signal and power isolation solution. It employs a double-balanced amplitude modulation technique to enable transformer coupling of signals ranging from true DC to frequencies up to 300kHz.

To generate the isolated power supplies for the front-end circuitry, an internal clock oscillator drives the primary winding of the integral DC/DC power transformer (T2). The voltage induced on the secondary winding is then rectified and filtered to produce the isolated supply rails.

This built-in isolated DC/DC converter supplies sufficient power for both the AD215ATI's internal isolated circuitry and user-supplied auxiliary components. By eliminating the need for an external DC/DC converter, it reduces board space and overall component cost when additional amplification or signal conditioning is required.

After the input signal is amplified by the uncommitted input operational amplifier, it is modulated onto a carrier frequency of approximately 2.5MHz and applied to the primary winding of the signal isolation transformer (T1). The signal induced on the secondary winding is then demodulated and passed

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through a low-pass Bessel filter with a cutoff frequency of 300kHz. This filtering process accurately reconstructs the original input signal.

The transformer's design and construction ensure that nonlinearity remains independent of both temperature and gain over the specified operating ranges. Following signal reconstruction, the output is processed through an offset trim stage and a final output buffer. The trim circuitry provides designers with the flexibility to adjust the output offset as required for precise system calibration.

FUNCTIONAL BLOCK DIAGRAM

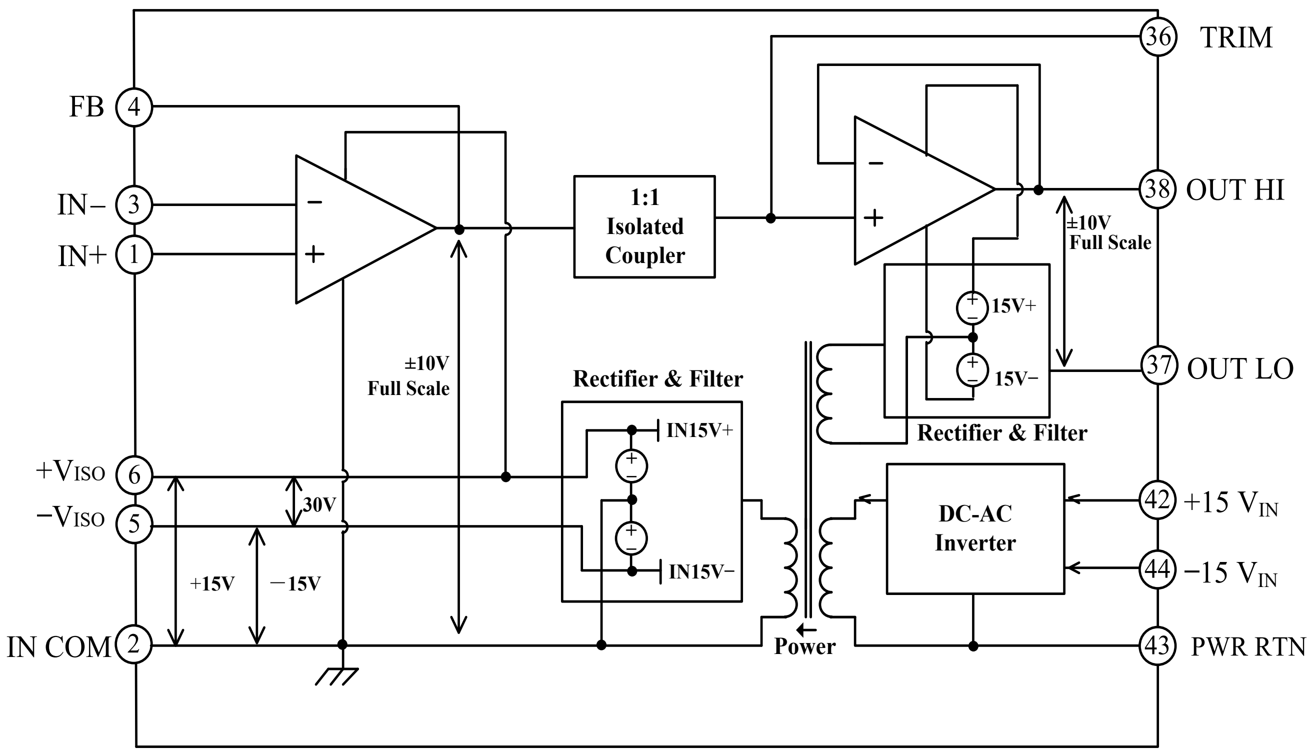

Figure 3. AD215ATI Functional Block Diagram

PIN DESIGNATIONS

Pin #	Pin Name	Function Description
1	+IN	Noninverting Input
2	I_{COM}	Input Common
3	−IN	Inverting Input
4	FB	Amplifier Feedback
5	−V_{ISO} Out	Isolated –15V DC Power Supply
6	+V_{ISO} Out	Isolated +15V DC Power Supply
36	TRIM	Output Offset Trim Adjust
37	OUT LO	Output Low
38	OUT HI	Output High
42	+15 V_{IN}	+15V DC Power
43	PWR RTN	±15V DC Power Supply Common
44	–15 V_{IN}	–15V DC Power

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SPECIFICATIONS

Table 1. Electrical characteristics. (Typical @ 25°C and V_S = ±15V, 2kΩ output load, unless otherwise noted.)

Model	Conditions	AD215AYATI/AD215BYATI			Units
		MIN	TYP	MAX	
GAIN					
Range		1		10	V/V
Error	G = 1V/V, No Load on V_{ISO}		±0.5	±2	%
vs. Temperature	0°C to +85°C		±15		ppm/°C
	–40°C to 0°C		±50		ppm/°C
vs. Supply Voltage	±(14.5V DC to 16.5V DC)		+100		ppm/V
vs. Isolated Supply Load			+20		ppm/mA
Nonlinearity					
AD215BYATI Grade	±10V Output Swing, G = 1V/V		±0.005	±0.015	%
	±10 V Output Swing, G = 10V/V		±0.01		%
AD215AYATI Grade	±10 V Output Swing, G = 1V/V		±0.01	±0.025	%
	±10 V Output Swing, G = 10V/V		±0.025		%
INPUT VOLTAGE RATINGS					
Input Voltage Rating	G = 1V/V	±10			V
Maximum Safe Differential Range	IN+ or IN–, to IN COM		±15		V
CMRR of Input Op Amp			100		dB
Isolation Voltage Rating					
AD215BYATI Grade	100% Tested	1500			Vrms
AD215AYATI Grade	100% Tested	750			Vrms
IMRR (Isolation Mode Rejection Ratio)	RS ≤ 100Ω (IN+ & IN–), G = 1V/V, 60Hz		120		dB
	RS ≤ 100Ω (IN+ & IN–), G = 1V/V, 1Hz		100		dB
	RS ≤ 100Ω (IN+ & IN–), G = 1V/V, 10Hz		80		dB
	RS ≤ 1kΩ (IN+ & IN–), G = 1V/V, 60Hz		105		dB
	RS ≤ 1kΩ (IN+ & IN–), G = 1V/V, 1Hz		85		dB
	RS ≤ 1kΩ (IN+ & IN–), G = 1V/V, 10Hz		65		dB
Leakage Current Input to Output	240Vrms, 60Hz			2	µA rms
INPUT IMPEDANCE					
Differential	G = 1V/V		16		MΩ
Common-Mode			2‖4.5		GΩ‖RpF
INPUT OFFSET VOLTAGE					
Initial	25°C		±0.4	±2.0	mV
vs. Temperature	0°C to +85°C		±2		µV/°C
	–40°C to 0°C		±20		µV/°C
OUTPUT OFFSET VOLTAGE					
Initial	@ +25°C, Trimmable to Zero	0	–35	–80	mV
vs. Temperature (0°C to 70°C)	0°C to +85°C		±30		µV/°C
	–40°C to 0°C		±80		µV/°C
vs. Supply Voltage			±350		µV/V
vs. Isolated Supply Load			–35		µV/mA
INPUT BIAS CURRENT					
Initial	25°C		±300		nA
vs. Temperature (0°C to 70°C)	–40°C to +85°C		±400		nA
INPUT DIFFERENCE CURRENT					
Initial	25°C		±3		nA
vs. Temperature (0°C to 70°C)	–40°C to +85°C		±40		nA
INPUT VOLTAGE NOISE					
Input Voltage Noise (1kHz)	Frequency > 10Hz		20		$8nV/\sqrt{Hz}$

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Model	Conditions	AD215AYATI/AD215BYATI			Units
		MIN	TYP	MAX	
DYNAMIC RESPONSE (2kΩ Load)					
Full Signal Bandwidth (–3dB)	G = 1V/V, $20V_{p-p}$ Signal	200	300		kHz
Transport Delay			1		µs
Slew Rate	±10V Output Swing		2		V/µs
Rise Time	10% to 90%, ±10V Output Swing		1		µs
DYNAMIC RESPONSE (2kΩ Load) Cont.					
Settling Time	to ±0.10%, ±10V Output Swing		4		µs
Overshoot			1		%
Harmonic Distortion Components	@ 1kHz		–80		dB
	@ 10kHz		–65		dB
Overload Recovery Time	G = 1V/V, ±15V Drive		5		µs
Output Overload Recovery Time	G > 5		10		µs
RATED OUTPUT					
Voltage	Out HI to Out LO	±10			V
Current	2kΩ Load	±5			mA
Max Capacitive Load			500		pF
Output Resistance			1		Ω
Output Ripple and Noise	1MHz Bandwidth		10		mV_{p-p}
	50kHz Bandwidth		2.5		mV_{p-p}
ISOLATED POWER OUTPUT					
Voltage	No Load	14.25	±15	±17.25	V
vs. Temperature	0°C to +85°C		+20		mV/°C
	–40°C to 0°C		+25		mV/°C
Current at Rated Supply Voltage			±10		mA
Regulation	No Load to Full Load		−90		mV/V
Line Regulation			290		mV/V
Ripple	1MHz Bandwidth, No Load		50		mV rms
POWER SUPPLY					
Supply Voltage	Rated Performance	±14.5	±15	±16.5	VDC
	Operating	±14.25		±17	VDC
Current	Operating (+15V DC/–15V DC Supplies)		+30/−30		mA
TEMPERATURE RANGE					
Rated Performance		−40		+85	°C
Storage		−40		+85	°C

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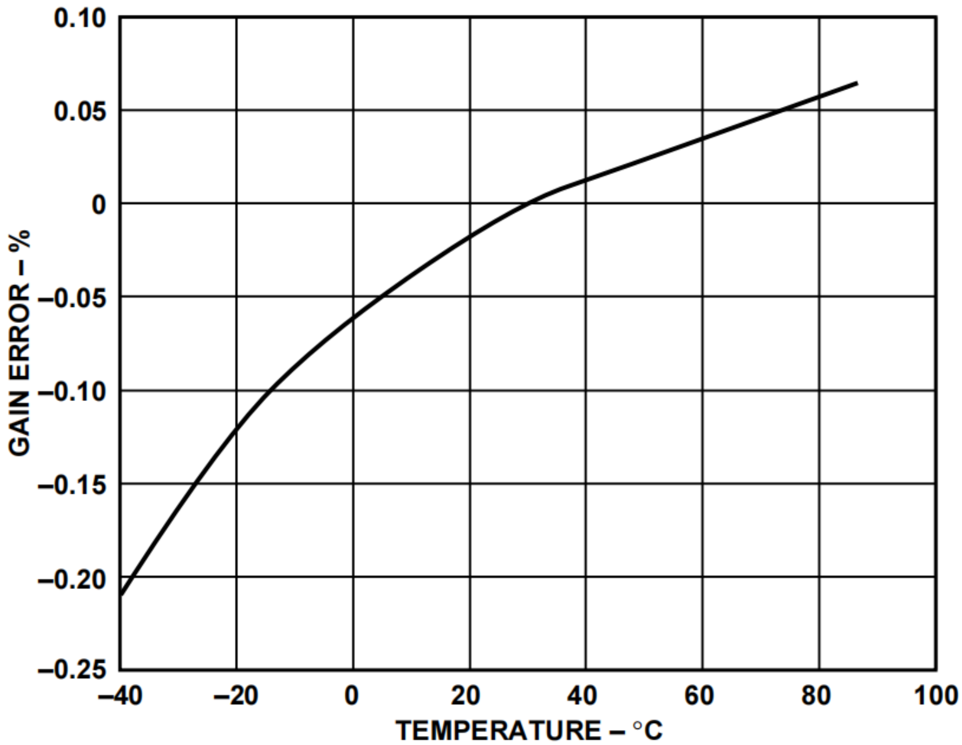

Figure 4. Gain Error vs. Temperature

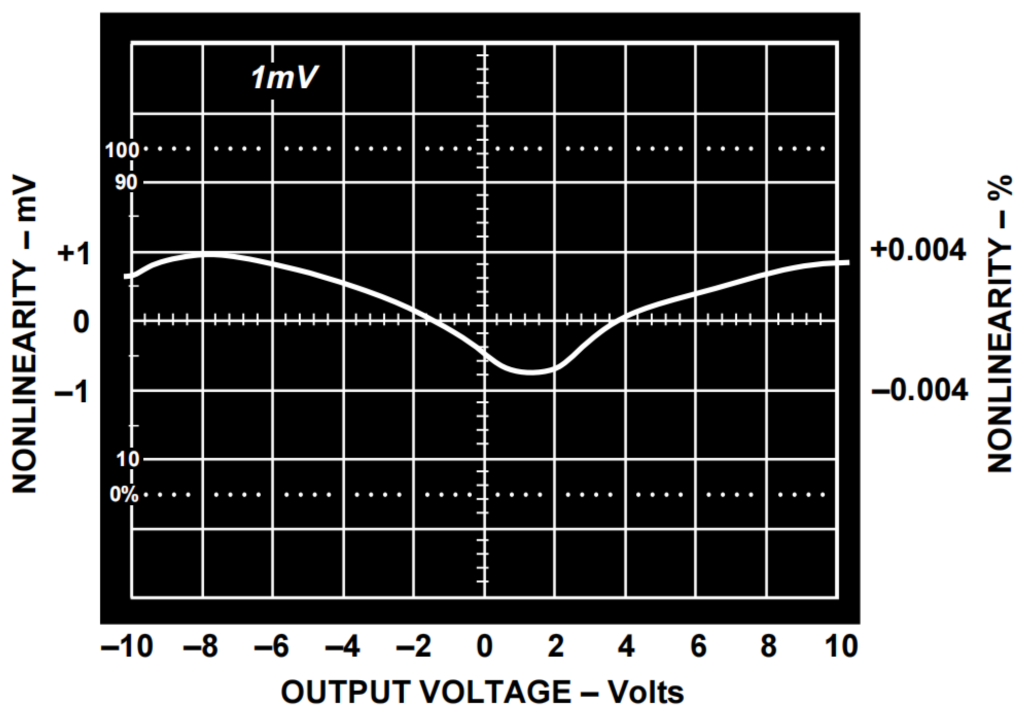

Figure 5. Gain Nonlinearity vs. Output Voltage (G = 1V/V)

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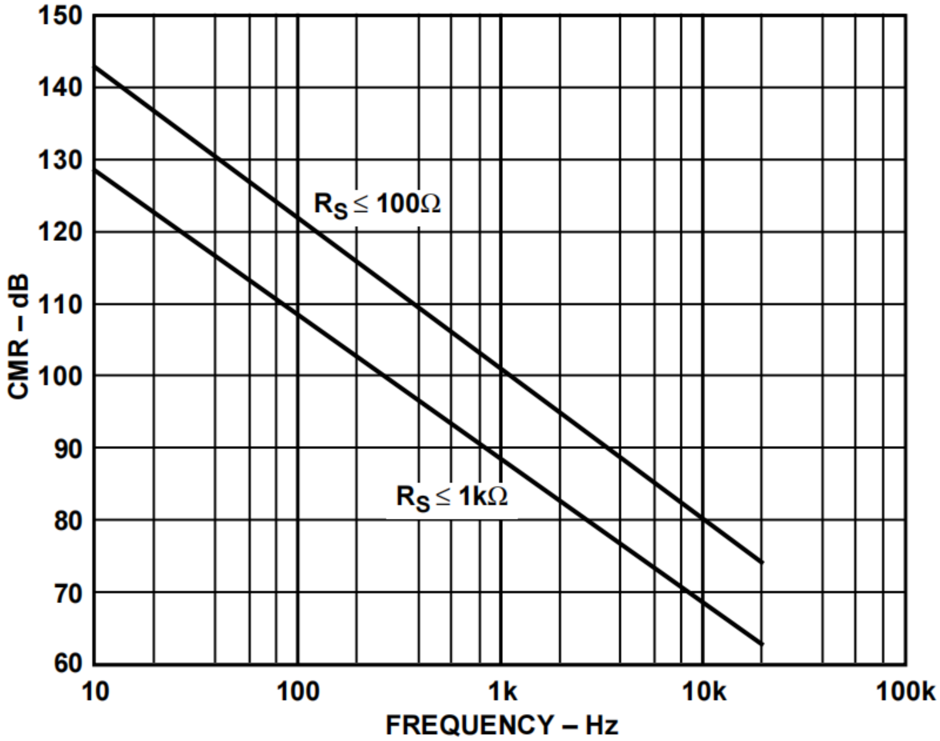

Figure 6. Typical Common-Mode Rejection vs. Frequency

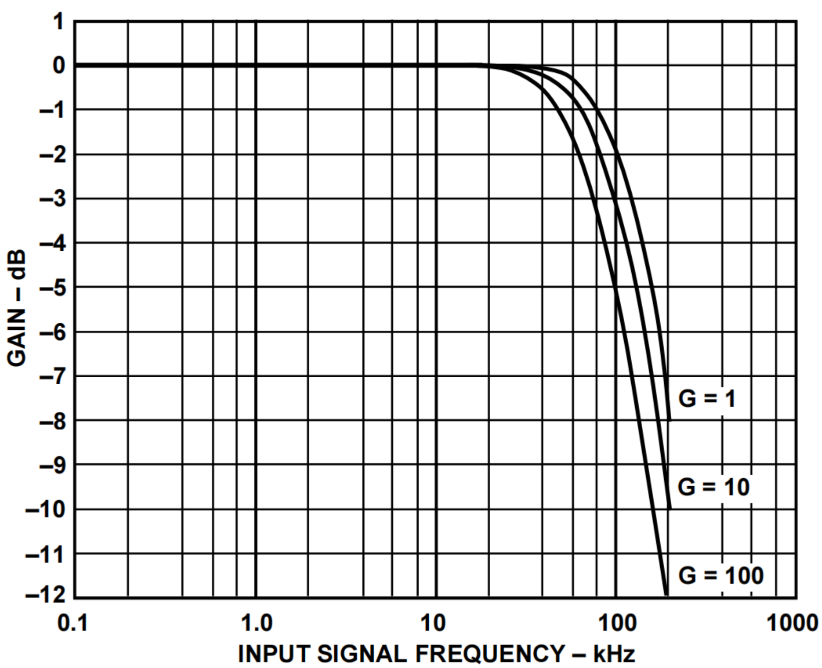

Figure 7. Gain Nonlinearity Error vs. Output

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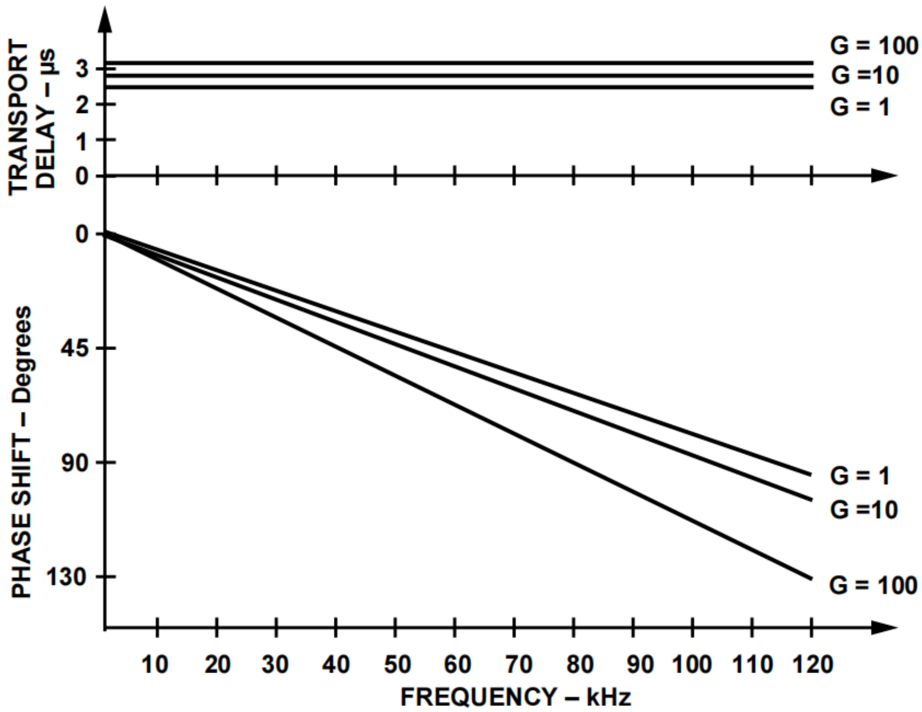

Figure 8. Phase Shift and Transport Delay vs. Frequency

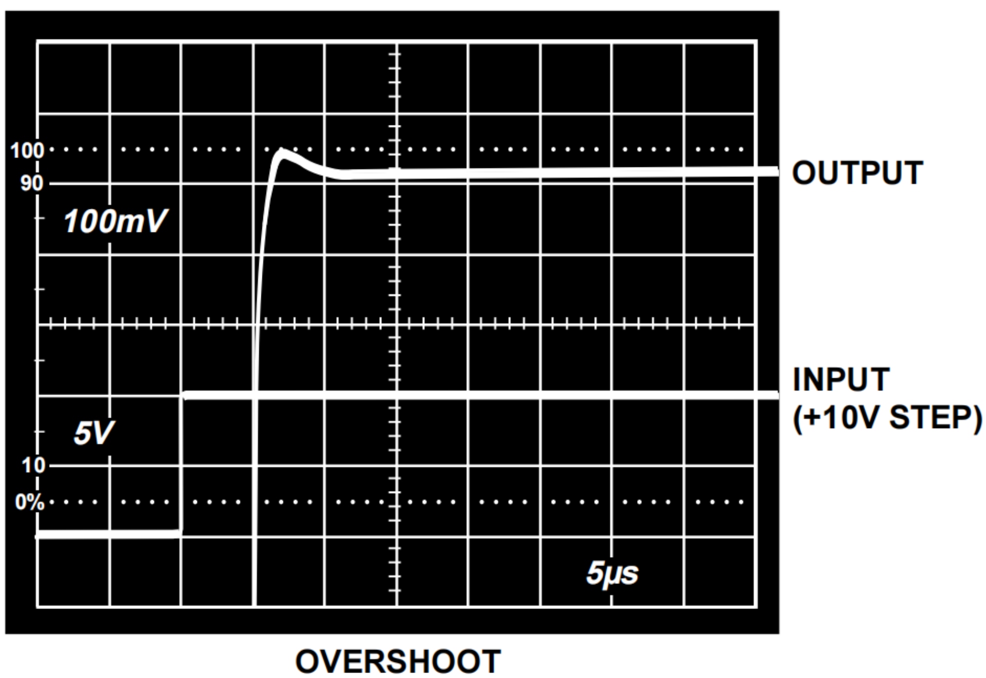

Figure 9a. Overshoot to a Full-Scale Step Input (G = 1V/V)

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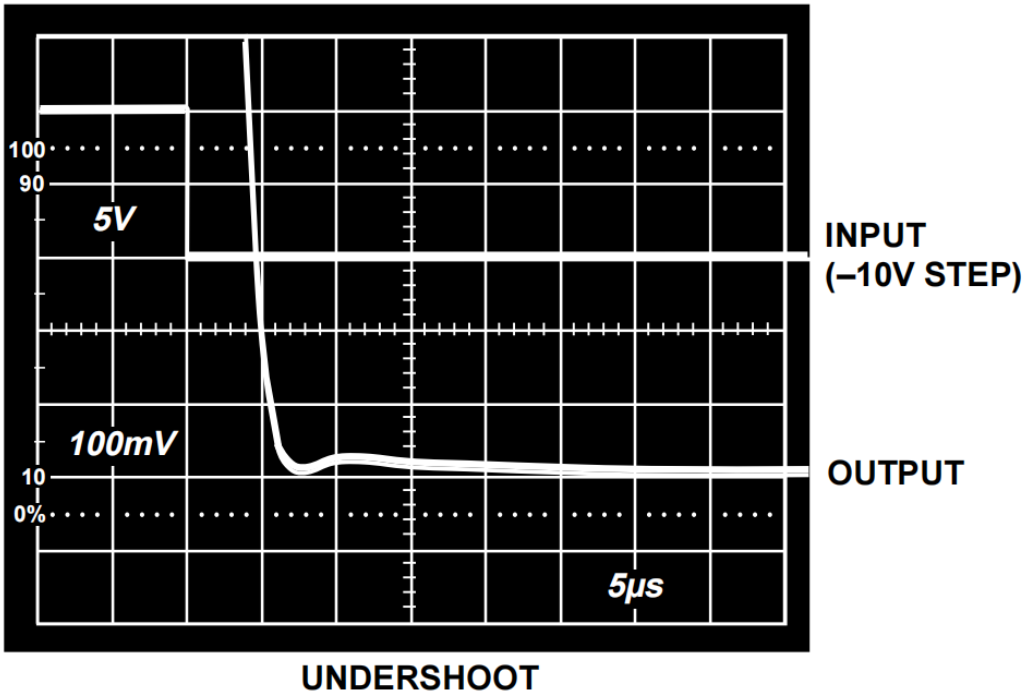

Figure 9b. Undershoot to a Full-Scale Input(G = 1V/V)

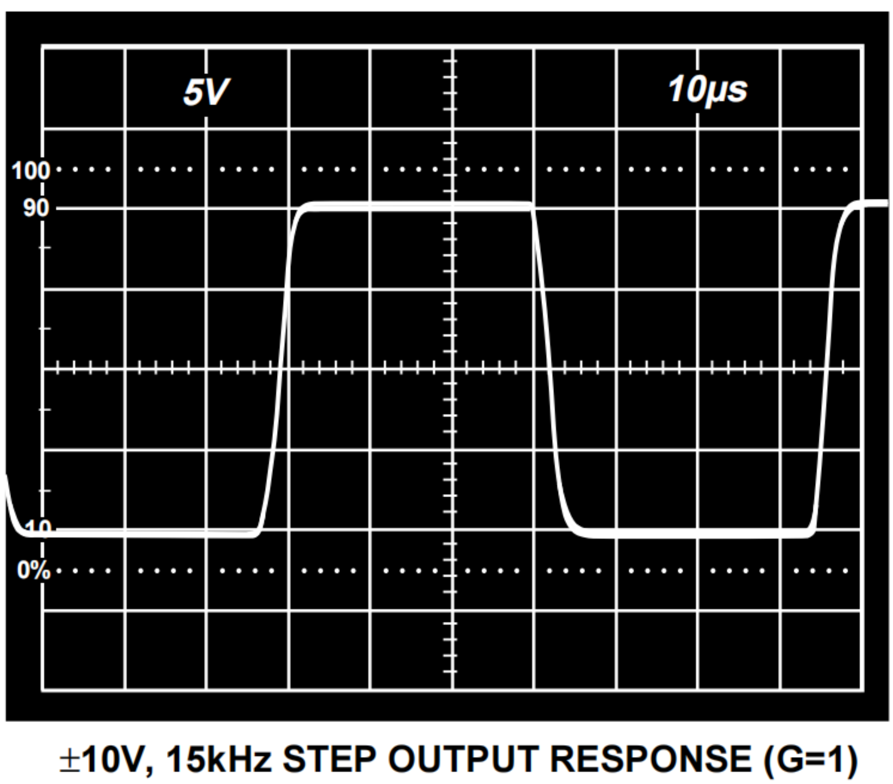

Figure 10. Output Response to Full-Scale Step Input

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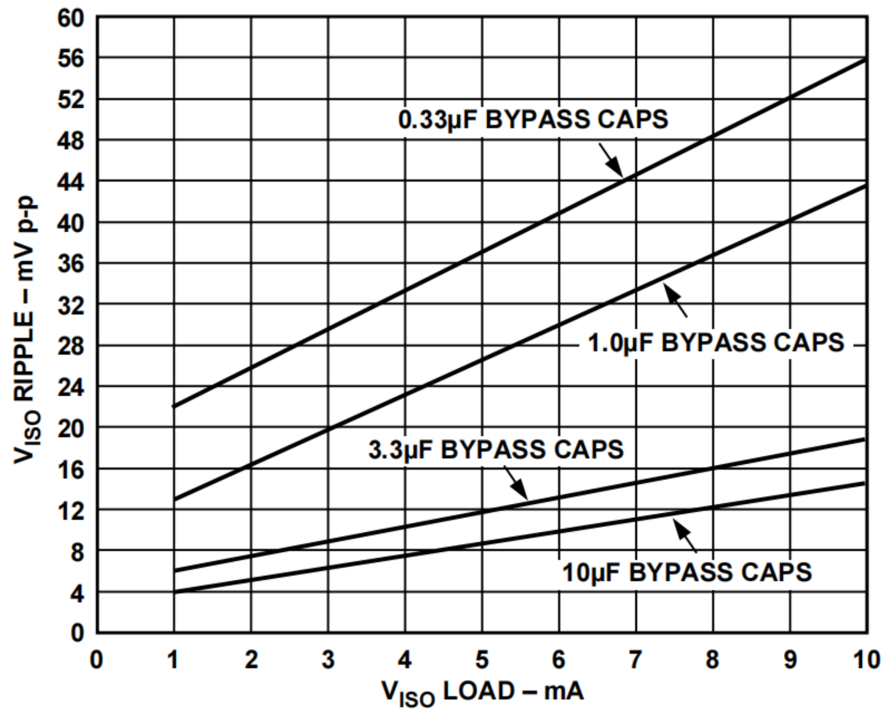

Figure 11. $\pm V_{ISO}$ Supply Ripple vs. Load

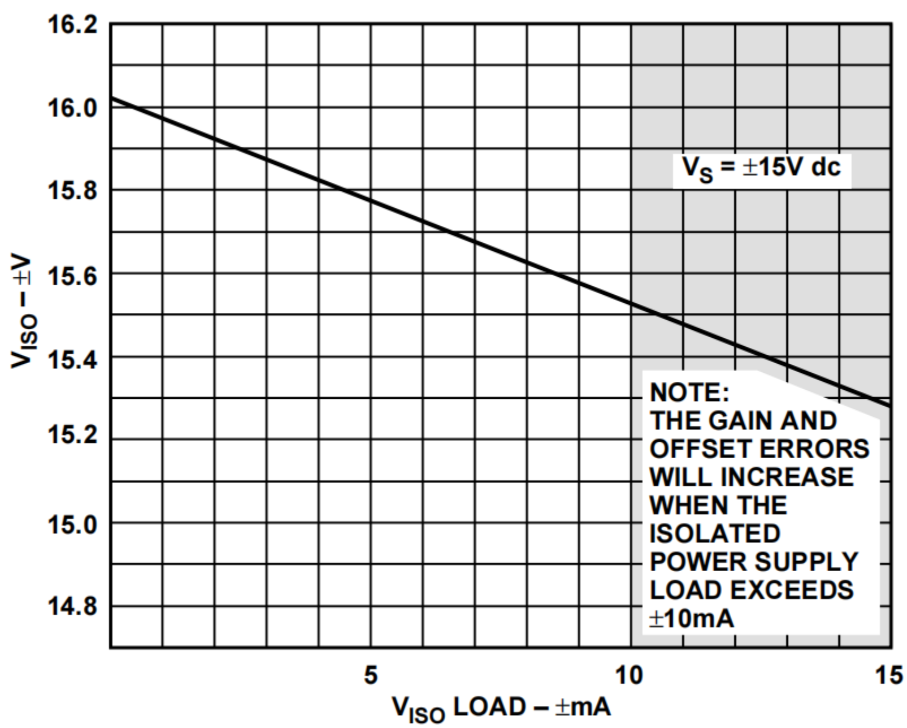

Figure 12. $\pm V_{ISO}$ Supply Voltage vs. Load

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MECHANICAL DIMENSIONS

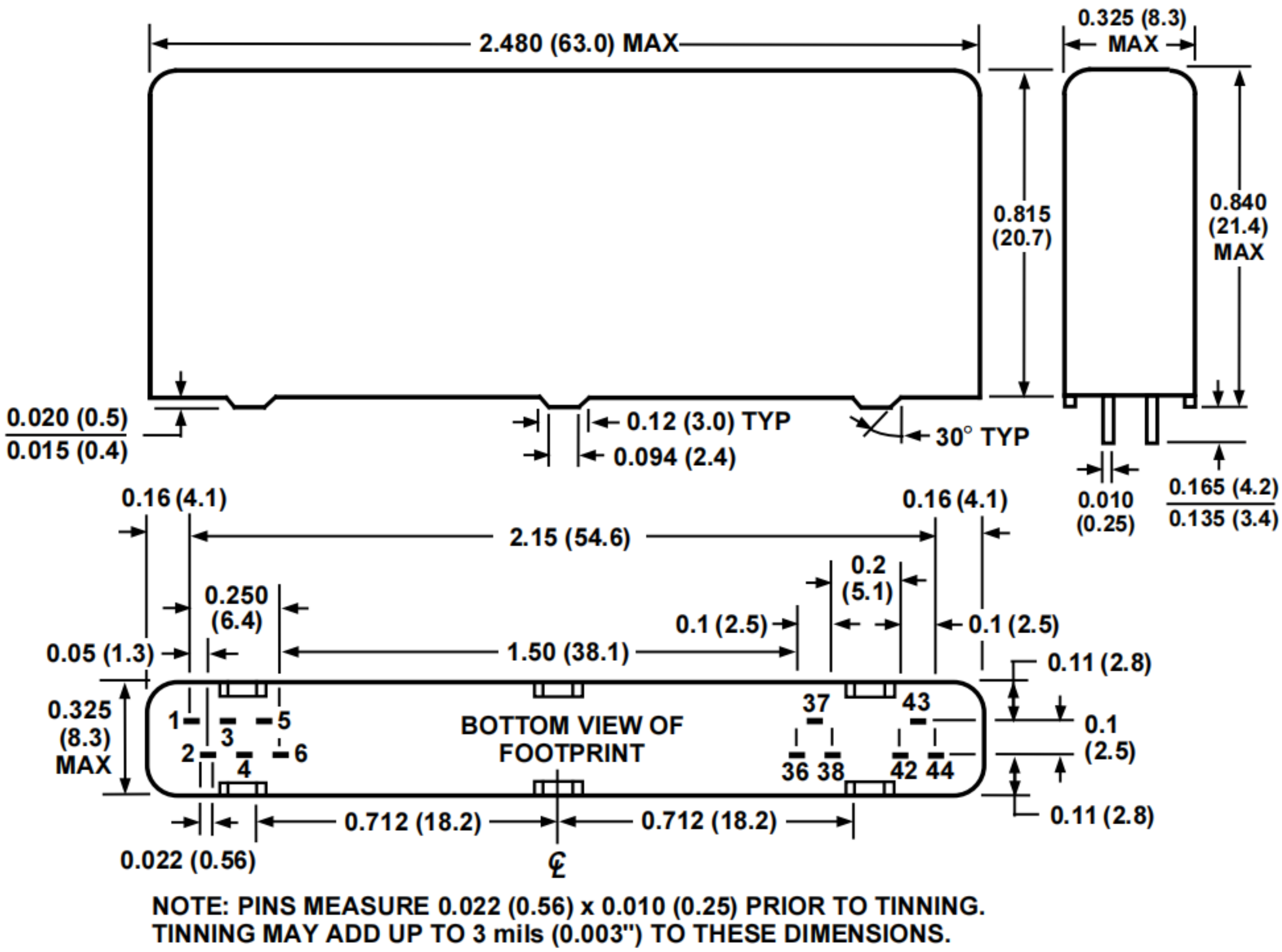

Figure 13. Dimensions of SIP Package

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