

FEATURES

Improved replacement for: INA117P and INA117KU
 ± 270 V common-mode voltage range
 Input protection to
 ± 500 V common mode
 ± 500 V differential mode
 Wide power supply range (± 2.5 V to ± 18 V)
 ± 10 V output swing on ± 12 V supply
 1 mA maximum power supply current

HIGH ACCURACY DC PERFORMANCE

3 ppm maximum gain nonlinearity (AD629B)
 $20 \mu\text{V}/^\circ\text{C}$ maximum offset drift (AD629A)
 $10 \mu\text{V}/^\circ\text{C}$ maximum offset drift (AD629B)
 $10 \text{ ppm}/^\circ\text{C}$ maximum gain drift

EXCELLENT AC SPECIFICATIONS

77 dB minimum CMRR @ 500 Hz (AD629A)
 86 dB minimum CMRR @ 500 Hz (AD629B)
 500 kHz bandwidth

APPLICATIONS

High voltage current sensing
 Battery cell voltage monitors
 Power supply current monitors
 Motor controls
 Isolation

FUNCTIONAL BLOCK DIAGRAM

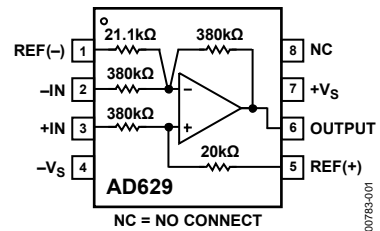


Figure 1.

GENERAL DESCRIPTION

The AD629 is a difference amplifier with a very high input, common-mode voltage range. It is a precision device that allows the user to accurately measure differential signals in the presence of high common-mode voltages up to ± 270 V.

The AD629 can replace costly isolation amplifiers in applications that do not require galvanic isolation. The device operates over a ± 270 V common-mode voltage range and has inputs that are protected from common-mode or differential mode transients up to ± 500 V.

The AD629 has low offset, low offset drift, low gain error drift, low common-mode rejection drift, and excellent CMRR over a wide frequency range.

The AD629 is available in low cost, 8-lead PDIP and 8-lead SOIC packages. For all packages and grades, performance is guaranteed over the industrial temperature range of -40°C to $+85^\circ\text{C}$.

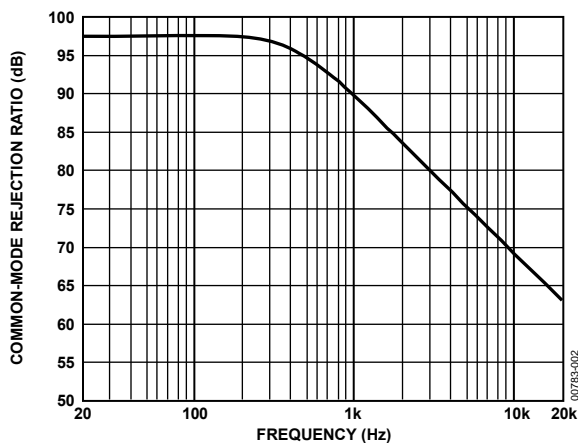


Figure 2. Common-Mode Rejection Ratio vs. Frequency

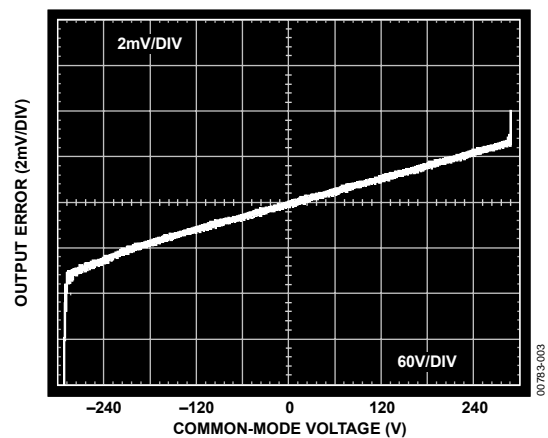


Figure 3. Error Voltage vs. Input Common-Mode Voltage

Rev. B

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SPECIFICATIONS

$T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{ V}$, unless otherwise noted.

Table 1.

Parameter	Condition	AD629A			AD629B			Unit
		Min	Typ	Max	Min	Typ	Max	
GAIN								
	$V_{OUT} = \pm 10\text{ V}$, $R_L = 2\text{ k}\Omega$							
Nominal Gain			1			1		V/V
Gain Error			0.01	0.05		0.01	0.03	%
Gain Nonlinearity			4	10		4	10	ppm
	$R_L = 10\text{ k}\Omega$		1			1	3	ppm
Gain vs. Temperature	$T_A = T_{MIN}$ to T_{MAX}		3	10		3	10	ppm/ $^\circ\text{C}$
OFFSET VOLTAGE								
Offset Voltage			0.2	1		0.1	0.5	mV
	$V_S = \pm 5\text{ V}$						1	mV
vs. Temperature	$T_A = T_{MIN}$ to T_{MAX}		6	20		3	10	$\mu\text{V}/^\circ\text{C}$
vs. Supply (PSRR)	$V_S = \pm 5\text{ V}$ to $\pm 15\text{ V}$	84	100		90	110		dB
INPUT								
Common-Mode Rejection Ratio	$V_{CM} = \pm 250\text{ V dc}$	77	88		86	96		dB
	$T_A = T_{MIN}$ to T_{MAX}	73			82			dB
	$V_{CM} = 500\text{ V p-p, dc to } 500\text{ Hz}$	77			86			dB
	$V_{CM} = 500\text{ V p-p, dc to } 1\text{ kHz}$		88			90		dB
Operating Voltage Range	Common mode			± 270			± 270	V
	Differential			± 13			± 13	V
Input Operating Impedance	Common mode		200			200		$\text{k}\Omega$
	Differential		800			800		$\text{k}\Omega$
OUTPUT								
Operating Voltage Range	$R_L = 10\text{ k}\Omega$	± 13			± 13			V
	$R_L = 2\text{ k}\Omega$	± 12.5			± 12.5			V
	$V_S = \pm 12\text{ V}$, $R_L = 2\text{ k}\Omega$	± 10			± 10			V
Output Short-Circuit Current			± 25			± 25		mA
Capacitive Load	Stable operation	1000			1000			pF
DYNAMIC RESPONSE								
Small Signal -3 dB Bandwidth			500			500		kHz
Slew Rate		1.7	2.1		1.7	2.1		V/ μs
Full Power Bandwidth	$V_{OUT} = 20\text{ V p-p}$		28			28		kHz
Settling Time	0.01%, $V_{OUT} = 10\text{ V step}$		15			15		μs
	0.1%, $V_{OUT} = 10\text{ V step}$		12			12		μs
	0.01%, $V_{CM} = 10\text{ V step}$, $V_{DIFF} = 0\text{ V}$		5			5		μs
OUTPUT NOISE VOLTAGE								
0.01 Hz to 10 Hz			15			15		$\mu\text{V p-p}$
Spectral Density, $\geq 100\text{ Hz}^1$			550			550		nV/ $\sqrt{\text{Hz}}$
POWER SUPPLY								
Operating Voltage Range		± 2.5		± 18	± 2.5		± 18	V
Quiescent Current	$V_{OUT} = 0\text{ V}$		0.9	1		0.9	1	mA
	T_{MIN} to T_{MAX}		1.2			1.2		mA
TEMPERATURE RANGE								
For Specified Performance	$T_A = T_{MIN}$ to T_{MAX}	-40		+85	-40		+85	$^\circ\text{C}$

¹ See Figure 19.

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage, V_S	± 18 V
Internal Power Dissipation ¹	
8-Lead PDIP (N)	See Figure 4
8-Lead SOIC (R)	See Figure 4
Input Voltage Range, Continuous	± 300 V
Common-Mode and Differential, 10 sec	± 500 V
Output Short-Circuit Duration	Indefinite
Pin 1 and Pin 5	$-V_S - 0.3$ V to $+V_S + 0.3$ V
Maximum Junction Temperature	150°C
Operating Temperature Range	-55°C to $+125^\circ\text{C}$
Storage Temperature Range	-65°C to $+150^\circ\text{C}$
Lead Temperature (Soldering 60 sec)	300°C

¹ Specification is for device in free air:
 8-Lead PDIP, $\theta_{JA} = 100^\circ\text{C}/\text{W}$;
 8-Lead SOIC, $\theta_{JA} = 155^\circ\text{C}/\text{W}$.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

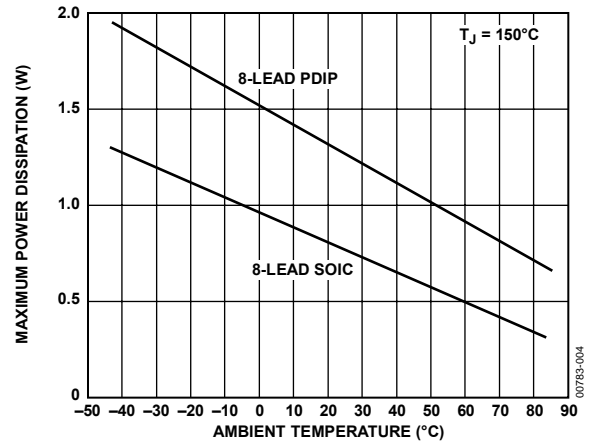


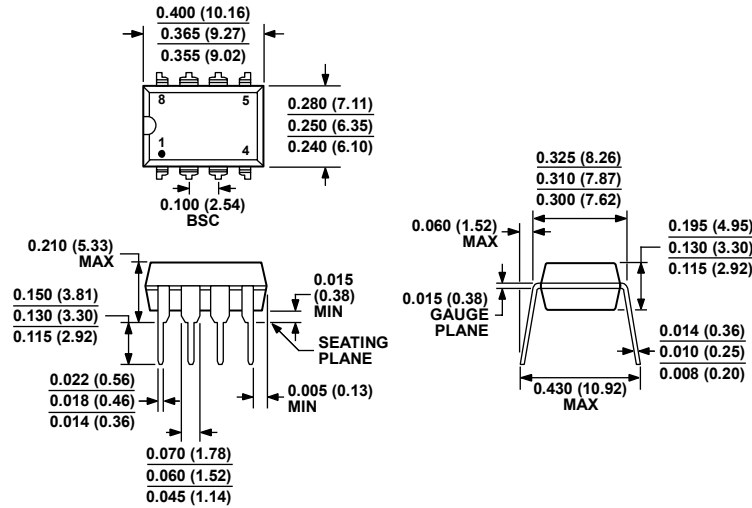
Figure 4. Maximum Power Dissipation vs. Temperature for SOIC and PDIP

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

OUTLINE DIMENSIONS

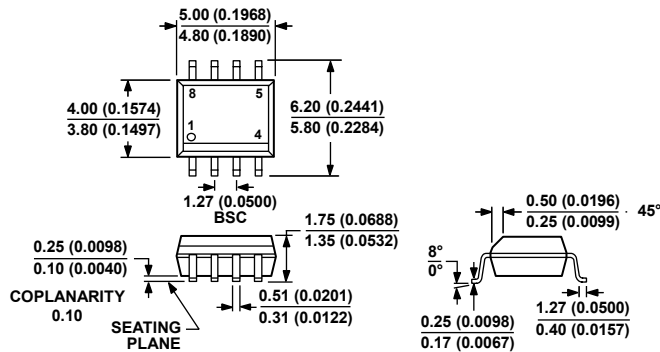


COMPLIANT TO JEDEC STANDARDS MS-001
 CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETER DIMENSIONS
 (IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.
 CORNER LEADS MAY BE CONFIGURED AS WHOLE OR HALF LEADS.

Figure 40. 8-Lead Plastic Dual In-Line Package [PDIP]
 (N-8)

Dimensions shown in inches and (millimeters)

070606-A



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 (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 41. 8-Lead Standard Small Outline Package [SOIC_N]
 (R-8)

Dimensions shown in millimeters and (inches)

012407-A

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD629AN	-40°C to +85°C	8-Lead PDIP	N-8
AD629ANZ ¹	-40°C to +85°C	8-Lead PDIP	N-8
AD629AR	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629AR-REEL	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629AR-REEL7	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629ARZ ¹	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629ARZ-RL ¹	-40°C to +85°C	8-Lead SOIC_N, 13-Inch Tape and Reel, 2,500 pieces	R-8
AD629ARZ-R7 ¹	-40°C to +85°C	8-Lead SOIC_N, 7-Inch Tape and Reel, 1,000 pieces	R-8
AD629BN	-40°C to +85°C	8-Lead PDIP	N-8
AD629BNZ ¹	-40°C to +85°C	8-Lead PDIP	N-8
AD629BR	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629BR-REEL	-40°C to +85°C	8-Lead SOIC_N, 13-Inch Tape and Reel, 2,500 pieces	R-8
AD629BR-REEL7	-40°C to +85°C	8-Lead SOIC_N, 7-Inch Tape and Reel, 1,000 pieces	R-8
AD629BRZ ¹	-40°C to +85°C	8-Lead SOIC_N	R-8
AD629BRZ-RL ¹	-40°C to +85°C	8-Lead SOIC_N, 13-Inch Tape and Reel, 2,500 pieces	R-8
AD629BRZ-R7 ¹	-40°C to +85°C	8-Lead SOIC_N, 7-Inch Tape and Reel, 1,000 pieces	R-8
AD629-EVAL		Evaluation Board	

¹ Z = RoHS compliant part.