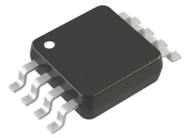
D8629

Zero-Drift, Single-Supply, Rail-to-Rail Input/Output Operational AmplifierDual Operational Amplifier

General Description

SOP8



MSOP8

The D8629 amplifier has ultralow offset, drift,and bias current. It is wide bandwidth auto-zero amplifiers featuring rail-to-rail input and output swings and low noise. Operation is fully specified from 2.7 V to 5 V single supply (±1.35 V to ±2.5 V dual supply).

The D8629 provide benefits previously found only in expensive auto-zeroing or chopper-stabilized amplifiers. Using Analog Devices' new topology, these zero-drift amplifiers combine low cost with high accuracy and low noise. (No exter- nal capacitor is required.) In addition, the D8629 greatly reduce the digital switching noise found in most chopper- stabilized amplifiers.

With an offset voltage of only 1 µV, drift of less than 0.005 µV/°C, and noise of only 0.5 µV p-p (0 Hz to 10 Hz), the D8629 are perfectly suited for applications in which error sources cannot be tolerated. Position and pressure sensors, medical equipment, and strain gage amplifiers benefit greatly from nearly zero drift over their operating temperature range. Many systems can take advantage of the rail-to-rail input and output swings provided by the D8629 to reduce input biasing complexity and maximize SNR.

The D8629 are specified for the extended industrial temperature range (−40°C to +125°C).

D8629 are available in the standard SOP8 and MSOP8 plastic packages.

Features

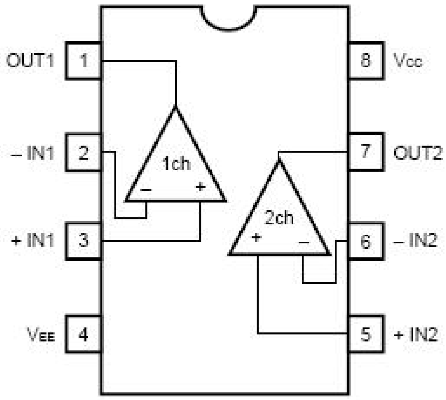
- Lowest auto-zero amplifier noise
- Low offset voltage: 1 µV
- Input offset drift: 0.002 µV/°C
- Rail-to-rail input and output swing
- 5 V single-supply operation
- High gain, CMRR, and PSRR: 120 dB
- Very low input bias current: 100 pA max
- Low supply current: 1.0 mA
- Overload recovery time: 10 µs
- No external components required

Package Information

Part NO.	Package Description	Package Marking	Package Option
D8629	SOP8	CHMC D8629 SXXXX	100/Tube 4000/Reel
D8629	MSOP8	CHMC D8629 SXXXX	100/Tube 4000/Reel

CHMC:Trademark D8629:Part NO. SXXXX:Lot NO.

Functional Block Diagram



D8629(SOP8/MSOP8)

Pin Description

Pin No.	Pin Name	Function
1	Output 1	Ch1 Output
2	Inverting Input1	Ch1 Inverting Input
3	Non-Inverting Input 1	Ch1 Non-Inverting Input
4	V_{EE}	Negative Power Supply
5	Non-Inverting Input 2	Ch2 Non-Inverting Input
6	Inverting Input2	Ch2 Inverting Input
7	Output 2	Ch2 Output
8	Vcc	Positive Power Supply

Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Supply Voltage		6	V
Differential Voltage*		±5.0	V
Input Voltage		GND-0.3 ~ V_{EE}+0.3	V
Output Short-Circuit Duration to GND		Indefinite	
Operating Temperature Range		-40 to +125	°C
Storage Temperature Range		-65 to 150	°C°C
Junction Temperature Range		-65 to 150	°C
Lead Temperature Range (Soldering,60s)		300	°C

*Differential input voltage is limited to ±5 V or the supply voltage, whichever is less.

Electrical Characteristics (Vcc=5.0V,VCM=2.5V,TA=25°C,unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	 −40°C≤T_A≤+125°C		1	5 10	µV µV
Input Bias Current	I_B	 −40°C≤T_A≤+125°C		30.	100 1.5	pA nA
Input Offset current	I_{OS}	 −40°C≤T_A≤+125°C		50	200 250	pA pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V to 5V −40°C≤T_A≤+125°C	120 115	140 130		dB dB
Large signal Voltage Gain	A_{VO}	R_L=10kΩ, V_O=0.3V to 4.7V −40°C≤T_A≤+125°C	125 120	145 135		dB dB
Offset Voltage Drift	ΔVos/ΔT	−40°C≤T_A≤+125°C		0.002	0.02	µV/°C
OUTPUT CHARACTERISTICS						
Output voltage High	V_{OH}	R_L=100kΩ to ground −40°C≤T_A≤+125°C R_L=10kΩ to ground −40°C≤T_A≤+125°C	4.99 4.99 4.95 4.95	4.996 4.995 4.98 4.97		V V V V
Output voltage Low	V_{OL}	R_L=100kΩ to ground −40°C≤T_A≤+125°C R_L=10kΩ to ground −40°C≤T_A≤+125°C		1 2 10 15	5 5 20 20	mV mV mV mV
Short-Circuit Limit	I_{SC}	−40°C≤T_A≤+125°C	±25	±50 ±40		mA mA
Output Current	I_O	−40°C≤T_A≤+125°C		±30 ±15		mA mA
POWER SUPPLY						
Power supply rejection Ratio	PSRR	V_S=2.7V to 5.5V −40°C≤T_A≤+125°C	 115	 130		 dB
Supply Current/Amplifier	I_{SY}	V_O=0V −40°C≤T_A≤+125°C		0.85 1.0	1.1 1.2	mA mA
INPUT CAPACITANCE						
Differential Common-Mode	C_{IN}			1.5 1.0		pF pF
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L=10kΩ		1.0		V/µs

Overload Recovery Time				0.05		ms
Gain Bandwidth Product	GBP			2.5		MHz
NOISE PERFORMANCE						
Voltage Noise	en p-p	0.1Hz to 10Hz		0.5		μV p-p
	en p-p	0.1Hz to 1.0Hz		0.16		mV p-p
Voltage Noise Density	en	f=1kHz		22		nV/√Hz
Current Noise Density	in	f=10Hz		5		fV/√Hz

(V_S=2.7V, V_{CM}=1.35V, V_O=1.4V, T_A=25°C, unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	 −40°C≤T_A≤+125°C		1	5 10	μV μV
Input Bias Current	I_B	 −40°C≤T_A≤+125°C		30.	100 1.5	pA nA
Input Offset current	I_{OS}	 −40°C≤T_A≤+125°C		50	200 250	pA pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V to 5V −40°C≤T_A≤+125°C	115 110	130 120		dB dB
Large signal Voltage Gain	A_{VO}	R_L=10kΩ, V_O=0.3V to 4.7V −40°C≤T_A≤+125°C	110 105	140 130		dB dB
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	−40°C≤T_A≤+125°C		0.002	0.02	μV/°C
OUTPUT CHARACTERISTICS						
Output voltage High	V_{OH}	R_L=100kΩ to ground −40°C≤T_A≤+125°C R_L=10kΩ to ground −40°C≤T_A≤+125°C	2.68 2.68 2.67 2.67	2.695 2.695 2.68 2.675		V V V V
Output voltage Low	V_{OL}	R_L=100kΩ to ground −40°C≤T_A≤+125°C R_L=10kΩ to ground −40°C≤T_A≤+125°C		1 2 10 15	5 5 20 20	mV mV mV mV
Short-Circuit Limit	Isc	−40°C≤T_A≤+125°C	±10	±15 ±10		mA mA
Output Current	I_O	−40°C≤T_A≤+125°C		±10 ±5		mA mA
POWER SUPPLY						
Power supply rejection Ratio	PSRR	V_S=2.7V to 5.5V −40°C≤T_A≤+125°C	 115	 130		 dB
Supply Current/Amplifier	I_{SY}	V_O=0V −40°C≤T_A≤+125°C		0.75 0.9	1.0 1.2	mA mA
INPUT CAPACITANCE						
Differential Common-Mode	C_{IN}			1.5 1.0		pF pF
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L=10kΩ		1.0		V/μs
Overload Recovery Time				0.05		ms
Gain Bandwidth Product	GBP			2.0		MHz
NOISE PERFORMANCE						
Voltage Noise	en p-p	0.1Hz to 10Hz		0.5		μV p-p
Voltage Noise Density	en	f=1kHz		22		nV/√Hz
Current Noise Density	in	f=10Hz		5		fV/√Hz

Characteristics Curves

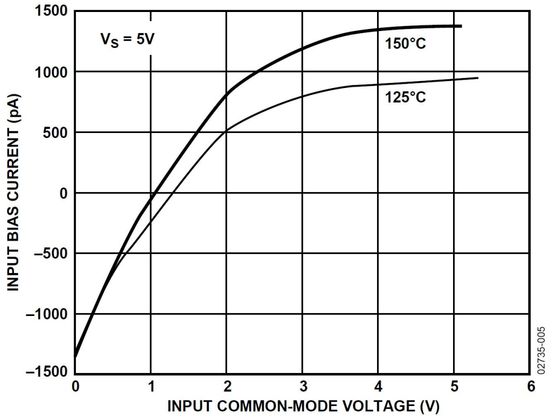


Figure 7. Input Bias Current vs. Input Common-Mode Voltage at 5 V

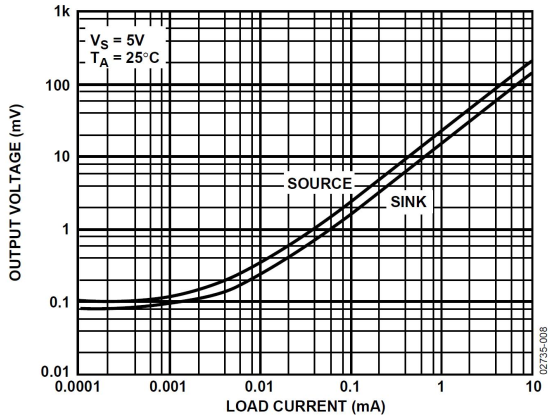


Figure 10. Output Voltage to Supply Rail vs. Load Current at 5 V

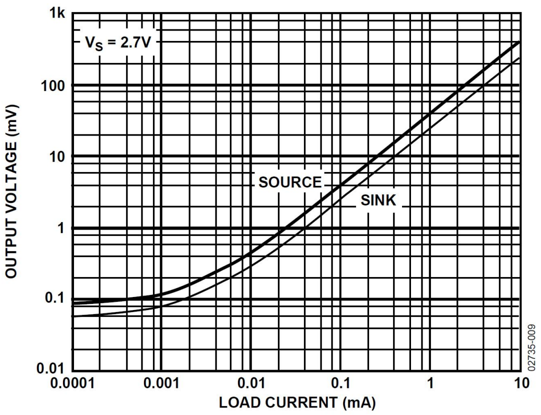


Figure 11. Output Voltage to Supply Rail vs. Load Current at 2.7 V

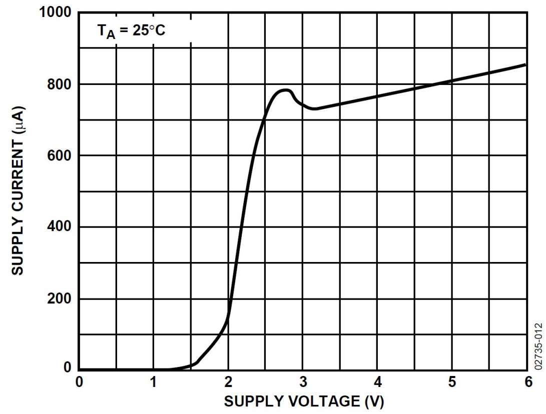


Figure 14. Supply Current vs. Supply Voltage

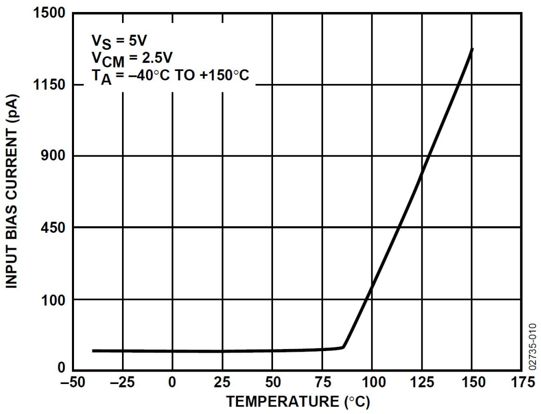


Figure 12. Input Bias Current vs. Temperature

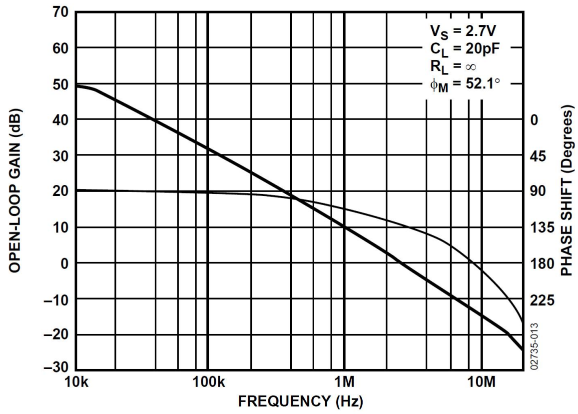


Figure 15. Open-Loop Gain and Phase vs. Frequency

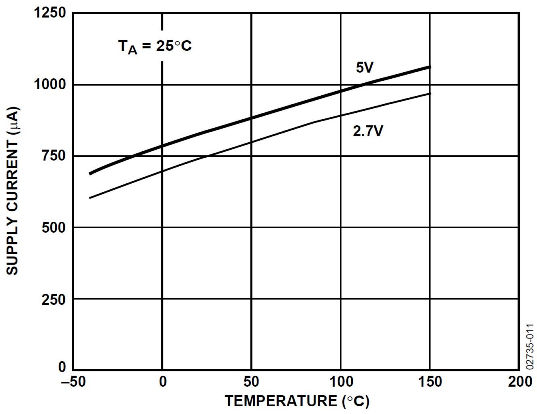


Figure 13. Supply Current vs. Temperature

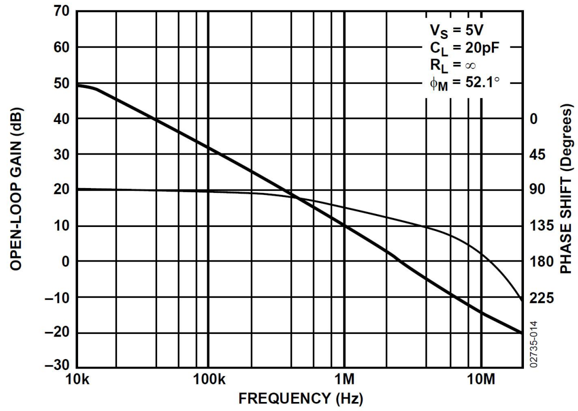


Figure 16. Open-Loop Gain and Phase vs. Frequency

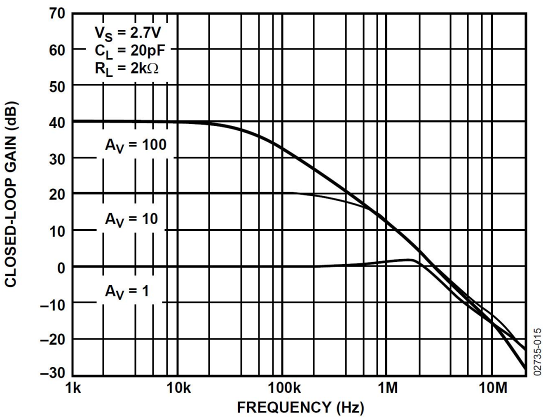


Figure 17. Closed-Loop Gain vs. Frequency at 2.7 V

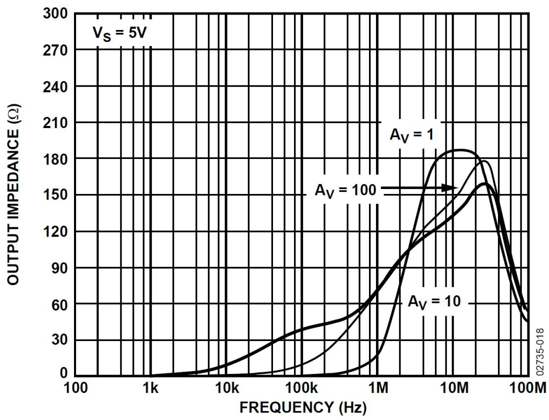


Figure 20. Output Impedance vs. Frequency at 5 V

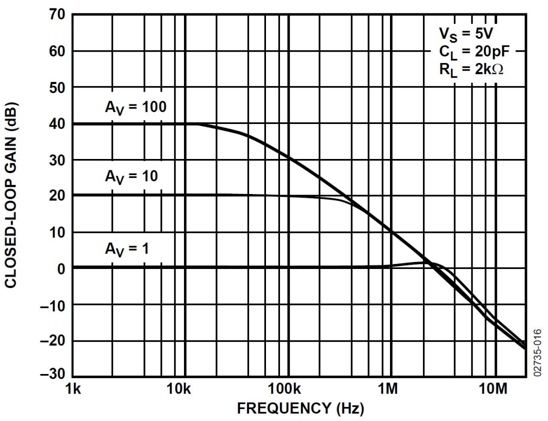


Figure 18. Closed-Loop Gain vs. Frequency at 5 V

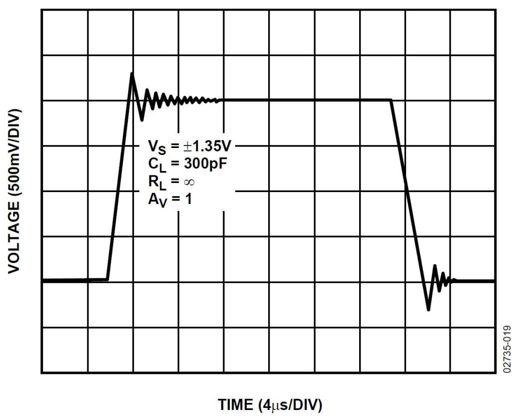


Figure 21. Large Signal Transient Response at 2.7 V

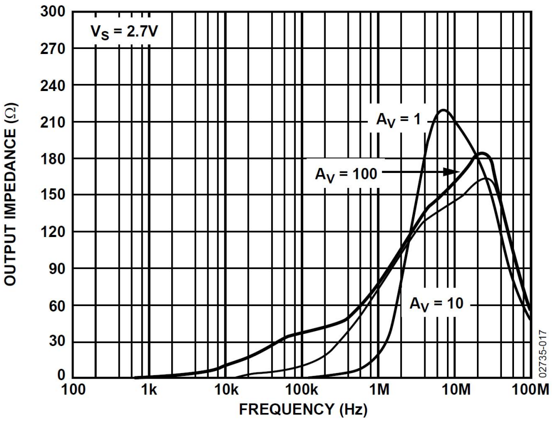


Figure 19. Output Impedance vs. Frequency at 2.7 V

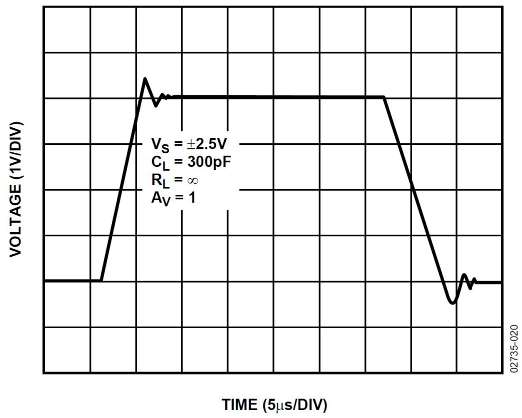


Figure 22. Large Signal Transient Response at 5 V

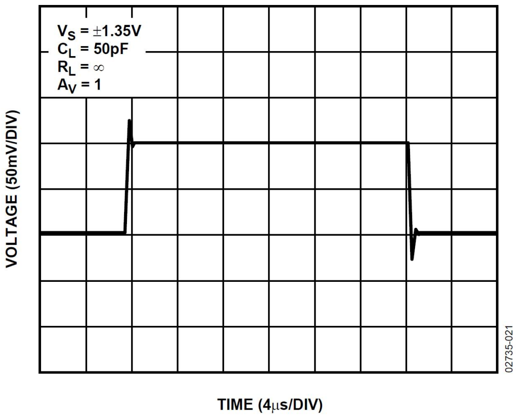


Figure 23. Small Signal Transient Response at 2.7 V

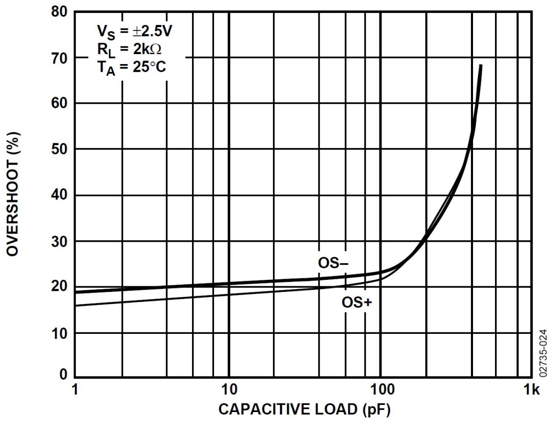


Figure 26. Small Signal Overshoot vs. Load Capacitance at 5 V

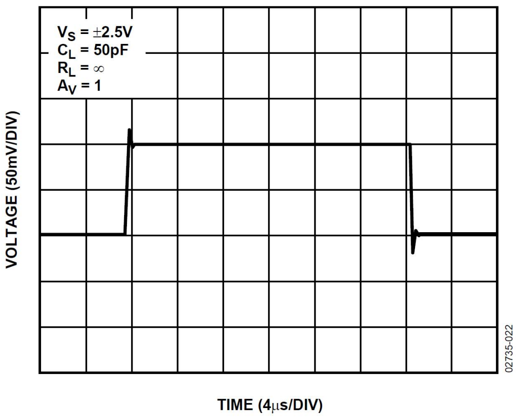


Figure 24. Small Signal Transient Response at 5 V

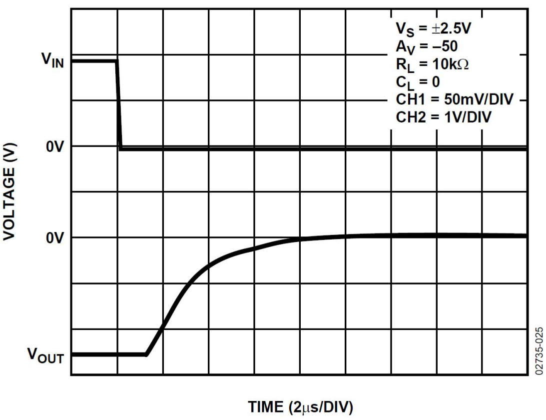


Figure 27. Positive Overvoltage Recovery

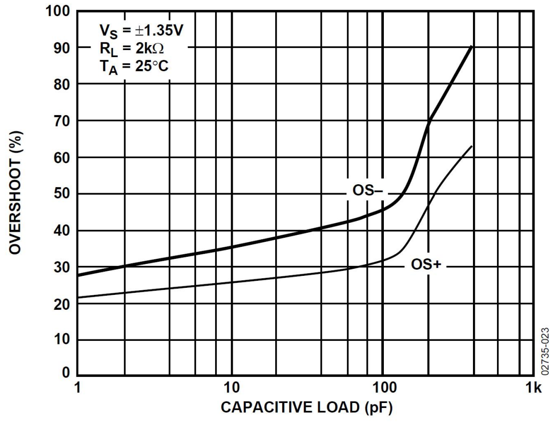


Figure 25. Small Signal Overshoot vs. Load Capacitance at 2.7 V

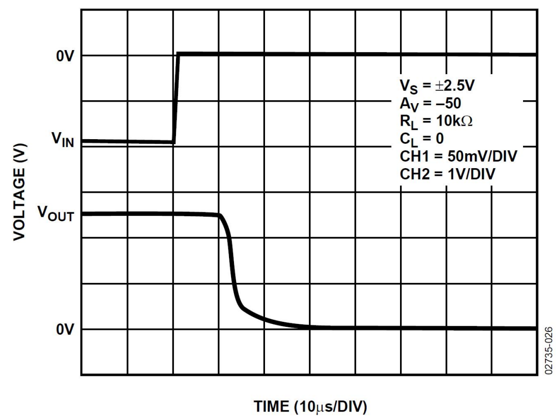


Figure 28. Negative Overvoltage Recovery

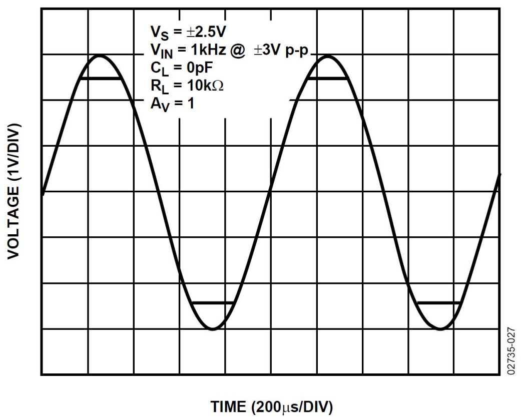


Figure 29. No Phase Reversal

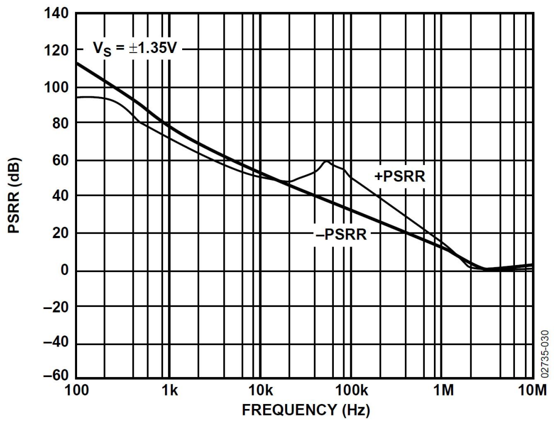


Figure 32. PSRR vs. Frequency

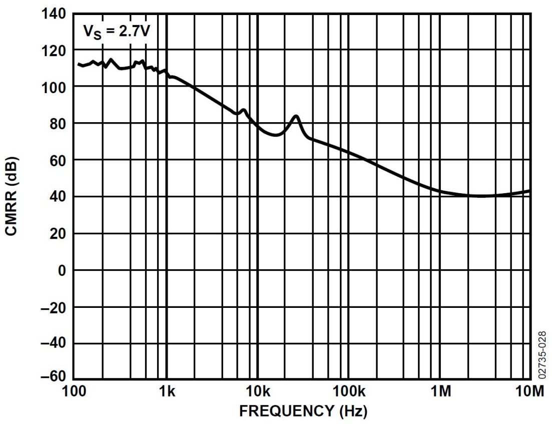


Figure 30. CMRR vs. Frequency at 2.7 V

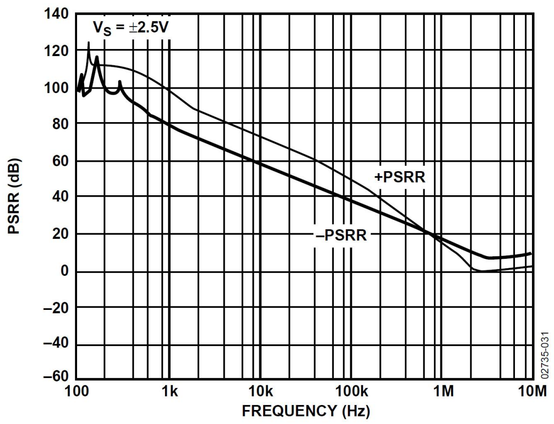


Figure 33. PSRR vs. Frequency

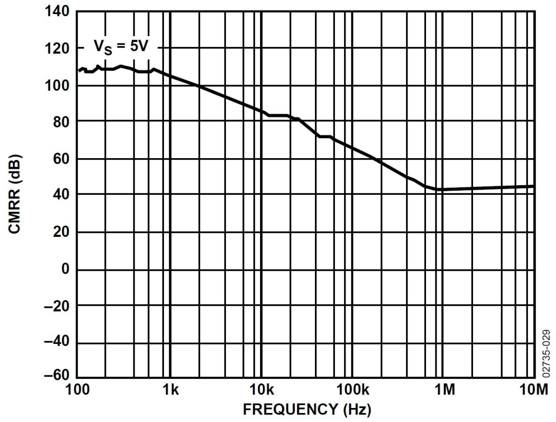


Figure 31. CMRR vs. Frequency at 5 V

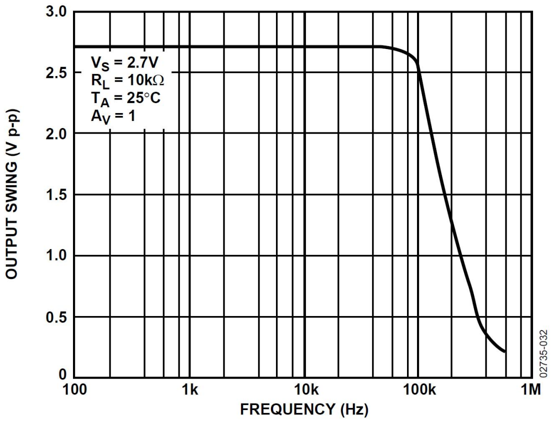


Figure 34. Maximum Output Swing vs. Frequency

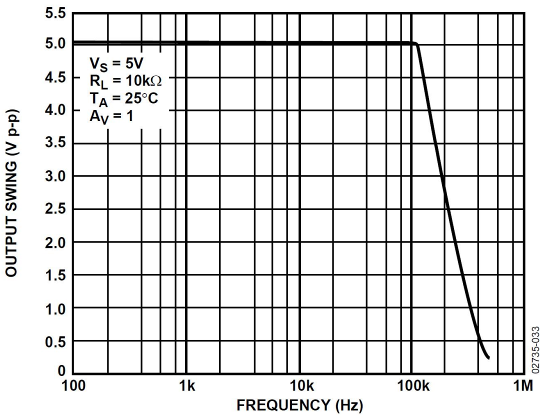


Figure 35. Maximum Output Swing vs. Frequency at 5 V

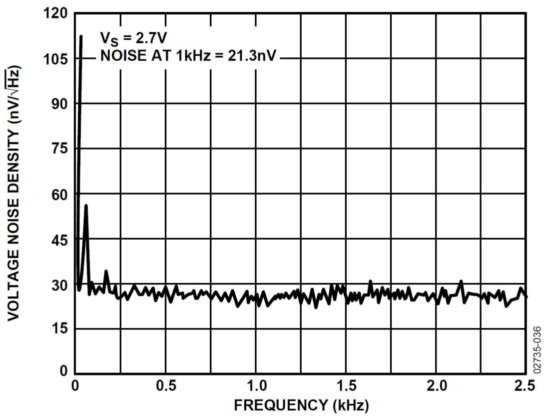


Figure 38. Voltage Noise Density at 2.7 V from 0 Hz to 2.5 kHz

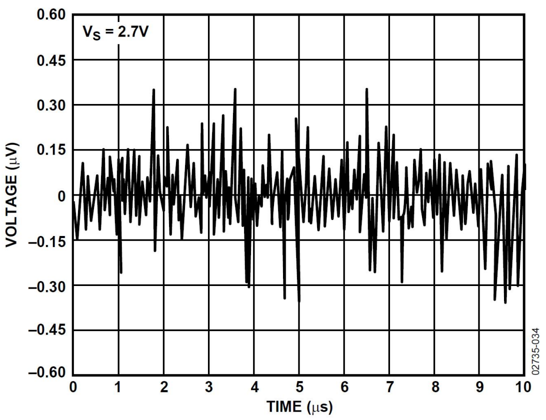


Figure 36. 0.1 Hz to 10 Hz Noise at 2.7 V

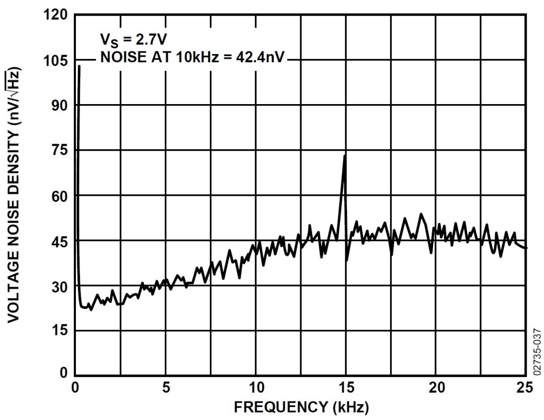


Figure 39. Voltage Noise Density at 2.7 V from 0 Hz to 25 kHz

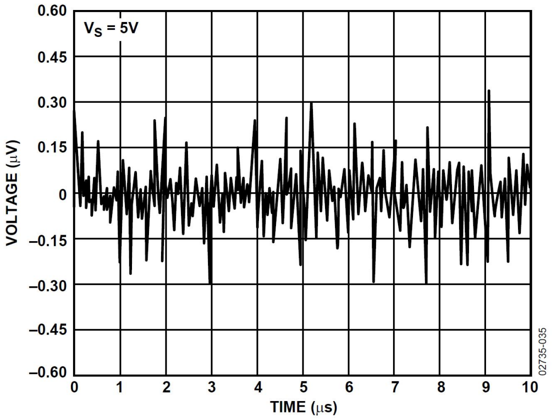


Figure 37. 0.1 Hz to 10 Hz Noise at 5 V

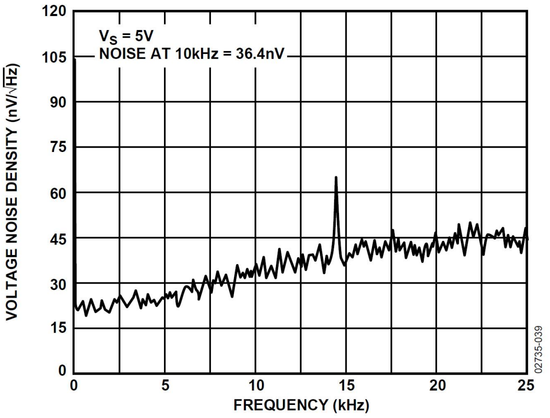


Figure 41. Voltage Noise Density at 5 V from 0 Hz to 25 kHz

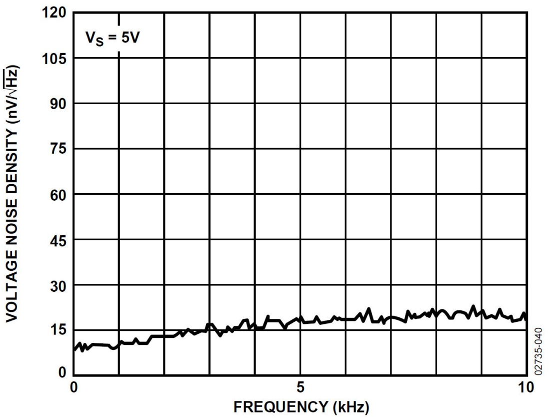


Figure 42. Voltage Noise

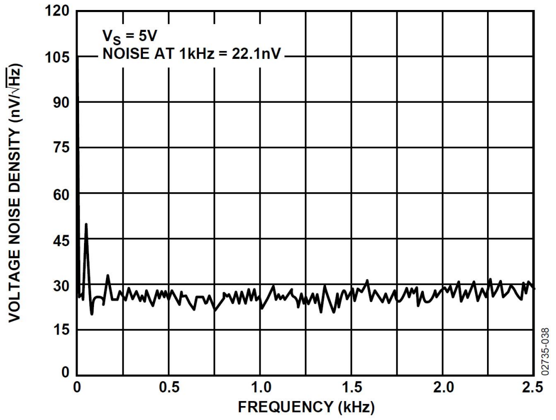


Figure 40. Voltage Noise Density at 5 V from 0 Hz to 2.5 kHz

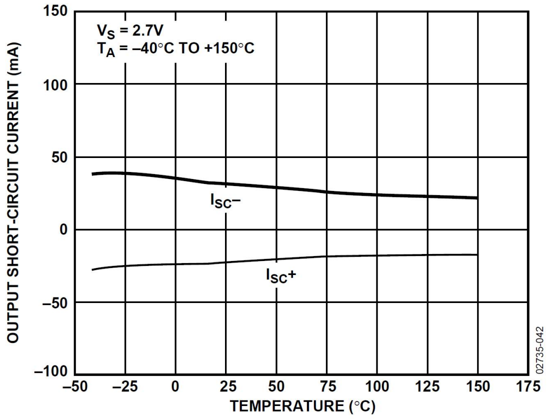


Figure 44. Output Short-Circuit Current vs. Temperature

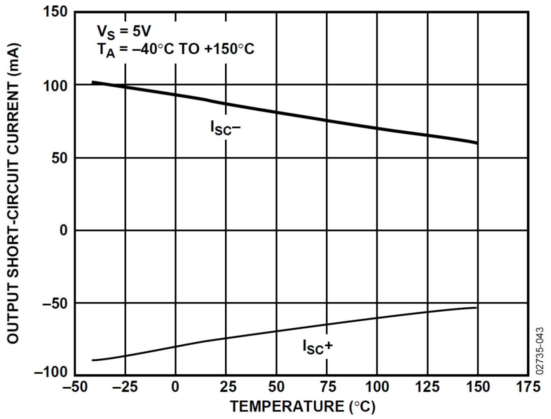


Figure 45. Output Short-Circuit Current vs. Temperature

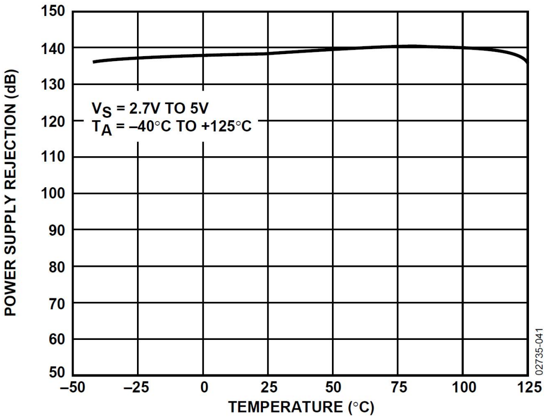


Figure 43. Power Supply Rejection vs. Temperature

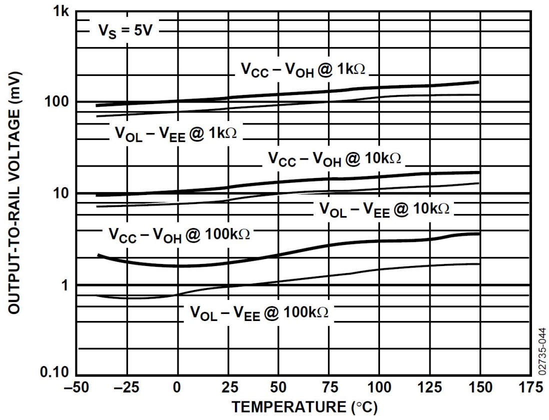


Figure 46. Output-to-Rail Voltage vs. Temperature

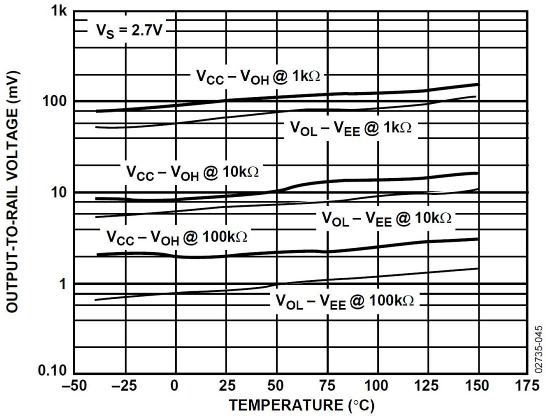


Figure 47. Output-to-Rail Voltage vs. Temperature

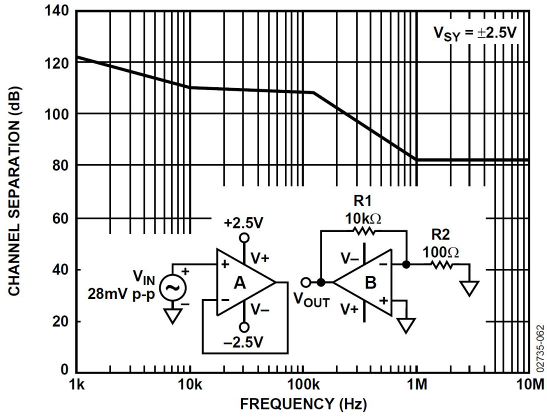
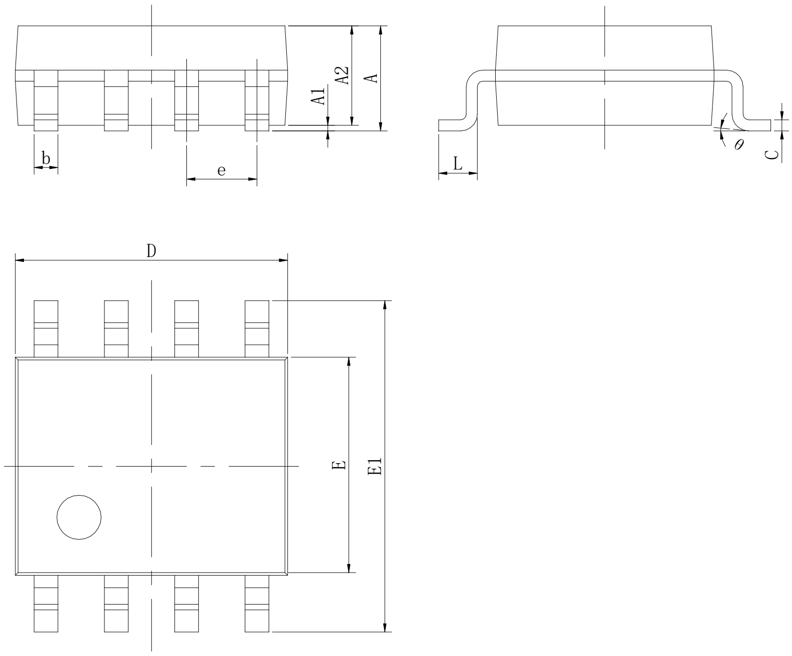


Figure 48. PS8629 Channel Separation

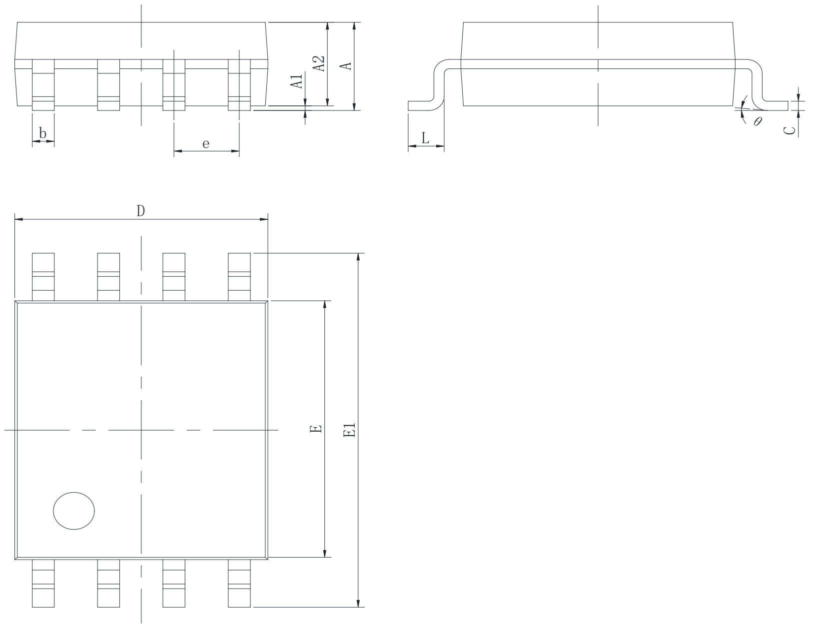
Outline Dimensions

SOP8 Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.000	0.250	0.000	0.010
A2	1.250	1.550	0.053	0.061
b	0.300	0.510	0.011	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

MSOP8 Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650(BSC)		0.026(BSC)	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

Statements

- Silicore Technology reserves the right to make changes without further notice to any products or specifications herein. Before customers place an order, customers need to confirm whether datasheet obtained is the latest version, and to verify the integrity of the relevant information.

- Failure or malfunction of any semiconductor products may occur under particular conditions, customers shall have obligation to comply with safety standards when customers use Silicore Technology products to do their system design and machine manufacturing, and take corresponding safety measures in order to avoid potential risk of failure that may cause personal injury or property damage.

- The product upgrades without end, Silicore Technology will wholeheartedly provide customers integrated circuits that have better performance and better quality.