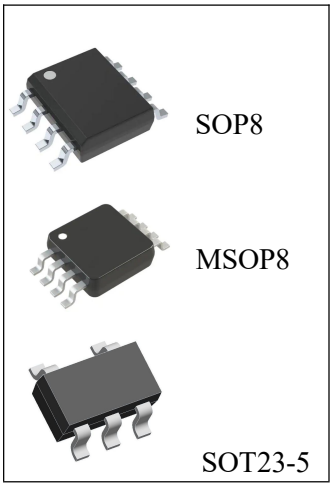
D8551/2

Single-Supply, Rail-to-Rail I/O Precision Operational Amplifier



General Description

The D8551 is a single and D8552 is a dual, precision operational amplifier which can operate from 2.5V to 5.5V single supply. The device provides rail-to-rail input and output operation.

The D8551/2 offers a low offset voltage less than 20μV and an ultra-low bias current of 10pA. The combination of characteristics makes the D8551/2 a good choice for temperature measurements, pressure and position sensors, strain gauge amplifiers and medical instrumentation, or any other 2.5V to 5.5V applications requiring precision and long-term stability.

The D8552 is available in Green SOP8 and MSOP8 packages,The D8551 is available in SOT23-5,SOP8 and MSOP8 packages.

The D8551/2 ESD (HBM) reaches 8kV. It is specified over the extended industrial temperature range (-40℃ to +125℃).

Features

- Low Offset Voltage: 20μV (MAX)
- Ultra-Low Input Bias Current: 10pA
- Large-Signal Voltage Gain: 145dB (TYP) at 5V
- PSRR: 110dB (TYP)
- CMRR: 105dB (TYP)
- Overload Recovery Time: 60μs (at VS = 5V)
- Rail-to-Rail Input and Output
- Supply Voltage Range: 2.5V to 5.5V
- Low Supply Current: 930μA (TYP)
- No External Capacitors Required
- -40℃ to +125℃ Operating Temperature Range

Application

- Pressure Sensors
- Temperature Measurements
- Precision Current Sensing
- Electronic Scales
- Strain Gauge Amplifiers
- Handheld Test Equipment
- Thermocouple Amplifiers
- Medical Instrumentation

Package Information

Part No.	Order No.	Package Description	Package Marking	Package Option
D8552F	D8552F	SOP8	CHMC D8552F SXXXX	4000/Reel 100/Tube
D8552M	D8552M	MSOP8	CHMC D8552M SXXXX	4000/Reel 100/Tube
D8551T	D8551T	SOT23-5	E8XY	3000/Reel
D8551F	D8551F	SOP8	CHMC D8551F SXXXX	4000/Reel 100/Tube
D8551M	D8551M	MSOP8	CHMC D8551M SXXXX	4000/Reel 100/Tube
D8551S	D8551S	SOT23-5	E8XY	3000/Reel

CHMC:Trademark E8:D8551T/D8551S D8552F/D8552M/D8551F/D8551M:Part NO. XY/SXXXX:Lot NO.

Absolute Maximum Ratings

Supply Voltage..... 6V
Input Voltage Range..... $-V_S$ to $(+V_S)$ +0.1V
Differential Input Voltage Range..... -5V to 5V
Junction Temperature..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s)..... +260℃
ESDSusceptibility
HBM.....8000V
MM..... ....400V

Recommended Operating Conditions

Operating Temperature Range..... -40℃ to +125℃

Overstress Caution

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD Sensitivity Caution

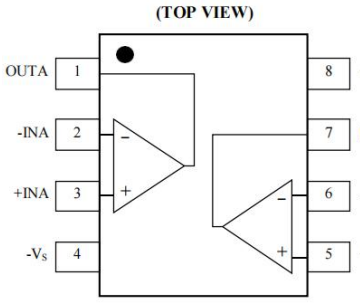
This integrated circuit can be damaged if ESD protections are not considered carefully. Silicore recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

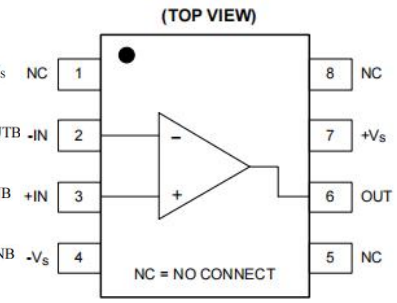
Disclaimer

Silicore reserves the right to make any change in circuit design, or specifications without prior notice.

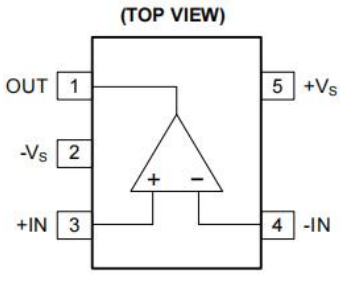
Pin Configuration



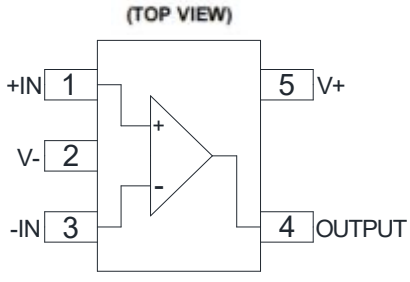
D8552(SOP8/MSOP8)



D8551(SOP8/MSOP8)



D8551T(SOT23-5)



D8551S(SOT23-5)

Electrical Characteristics

(At T_A = +25℃, V_S = 5V, V_{CM} = 2.5V, V_{OUT} = 2.5V, Full = -40℃ to +125℃, unless otherwise noted.)

Parameter	Conditions	Temp	Min	Typ	Max	Units
Input Characteristics						
Input Offset Voltage (V_{OS})		+25℃		4	20	μV
		Full			24	
Input Bias Current (I_B)		+25℃		10		pA
Input Offset Current (I_{OS})		+25℃		5		pA
Input Voltage Range		+25℃	0		5	V
Common Mode Rejection Ratio (1) (CMRR)	V_{CM} = 0V to 5V	+25℃	90	105		dB
		Full	83			
Large-Signal Voltage Gain (A_{VO})	R_L = 10kΩ, V_{OUT} = 0.3V to 4.7V	+25℃	100	145		dB
		Full	97			
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$)		Full		20		nV/℃
Output Characteristics						
Output Voltage High (V_{OH})	R_L = 100kΩ to -V_S	+25℃	4.99	4.998		V
		Full	4.987			
	R_L = 10kΩ to -V_S	+25℃	4.985	4.996		
		Full	4.98			
Output Voltage Low (V_{OL})	R_L = 100kΩ to +V_S	+25℃		2	10	mV
		Full			13	
	R_L = 10kΩ to +V_S	+25℃		6	15	
		Full			20	
Short-Circuit Limit (I_{SC})	V_{OUT} = 2.5V, R_L = 10Ω to GND	+25℃	40	48		mA
		Full	23			
Power Supply						
Power Supply Rejection Ratio (1) (PSRR)	V_S = 2.5V to 5.5V	+25℃	90	110		dB
		Full	80			
Quiescent Current (I_Q)	V_{OUT} = V_S/2	+25℃		930	1110	μA
		Full			1760	
Dynamic Performance						
Gain-Bandwidth Product (GBP)	A_V = +100	+25℃		1.53		MHz
Slew Rate (SR)	A_V = +1, R_L = 10kΩ, 2V output step	+25℃		0.90		V/μs
Overload Recovery Time	A_V = -100, R_L = 10kΩ, V_{IN} = 200mV (RET to GND)	+25℃		0.06		ms
Noise Performance						
Input Voltage Noise ($e_{n\ P-P}$)	0.1Hz to 10Hz	+25℃		0.80		μV_{P-P}
Input Voltage Noise Density (e_n)	f = 1kHz	+25℃		47.5		nV/$\sqrt{Hz}$

NOTE: 1. PSRR and CMRR are affected by the matching between external gain-setting resistor ratios.

Electrical Characteristics (continued)

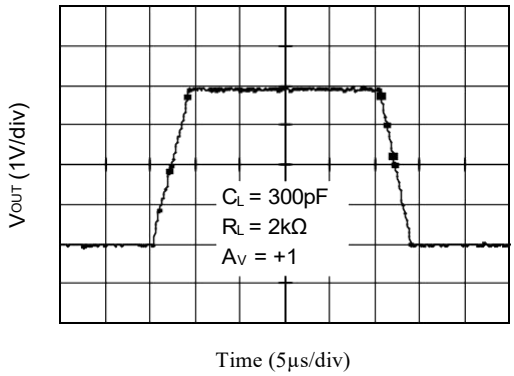
(At T_A = +25°C, V_S = 2.5V, V_{CM} = 1.25V, V_{OUT} = 1.25V, Full = -40°C to +125°C, unless otherwise noted.)

Parameter	Conditions	Temp	Min	Typ	Max	Units
Input Characteristics						
Input Offset Voltage (V_{OS})		+25°C		3	20	µV
		Full			24	
Input Bias Current (I_B)		+25°C		10		pA
Input Offset Current (I_{OS})		+25°C		10		pA
Input Voltage Range		+25°C	0		2.5	V
Common Mode Rejection Ratio (1) (CMRR)	V_{CM} = 0V to 2.5V	+25°C	90	105		dB
		Full	81			
Large-Signal Voltage Gain (A_{VO})	R_L = 10kΩ, V_{OUT} = 0.3V to 2.4V	+25°C	100	135		dB
		Full	94			
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$)		Full		20		nV/°C
Output Characteristics						
Output Voltage High (V_{OH})	R_L = 100kΩ to -V_S	+25°C	2.49	2.499		V
		Full	2.488			
	R_L = 10kΩ to -V_S	+25°C	2.485	2.498		
		Full	2.482			
Output Voltage Low (V_{OL})	R_L = 100kΩ to +V_S	+25°C		1	10	mV
		Full			12	
	R_L = 10kΩ to +V_S	+25°C		3	15	
		Full			18	
Short-Circuit Limit (I_{SC})	V_{OUT} = 1.25V, R_L = 10Ω to GND	+25°C	20	28		mA
		Full	15			
Power Supply						
Power Supply Rejection Ratio (1) (PSRR)	V_S = 2.5V to 5.5V	+25°C	90	110		dB
		Full	80			
Quiescent Current (I_Q)	V_{OUT} = V_S/2	+25°C		1000	1110	µA
		Full			2090	
Dynamic Performance						
Gain-Bandwidth Product (GBP)	A_V = +100	+25°C		1.51		MHz
Slew Rate (SR)	A_V = +1, R_L = 10kΩ, 2V output step	+25°C		0.90		V/µs
Overload Recovery Time	A_V = -100, R_L = 10kΩ, V_{IN} = 200mV (RET to GND)	+25°C		0.03		ms
Noise Performance						
Input Voltage Noise ($e_{n\ P-P}$)	0.1Hz to 10Hz	+25°C		0.95		μV_{P-P}
Input Voltage Noise Density (e_n)	f = 1kHz	+25°C		53		nV/$\sqrt{Hz}$

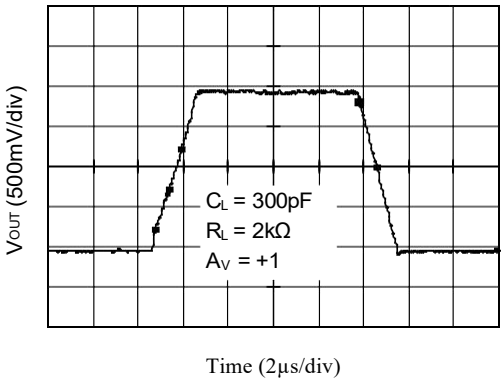
NOTE: 1. PSRR and CMRR are affected by the matching between external gain-setting resistor ratios.

Typical Performance Characteristics

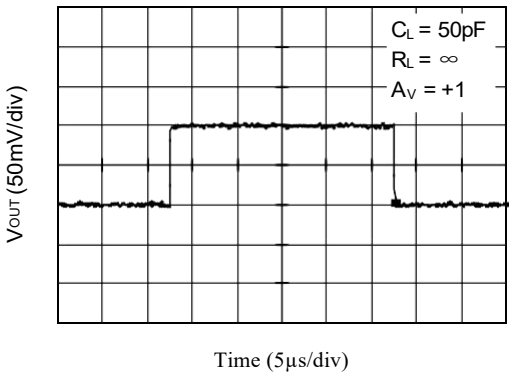
Large Signal Transient Response at +5V



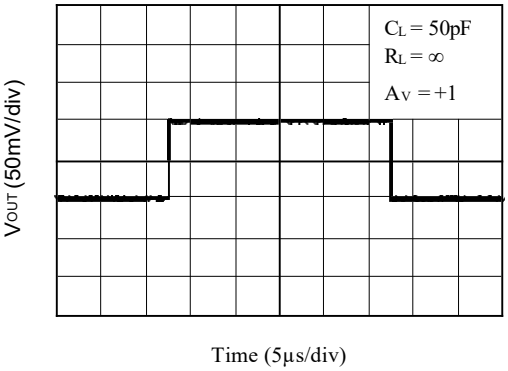
Large Signal Transient Response at +2.5V



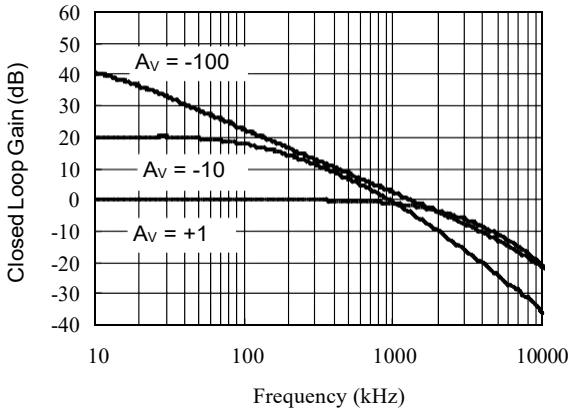
Small Signal Transient Response at +5V



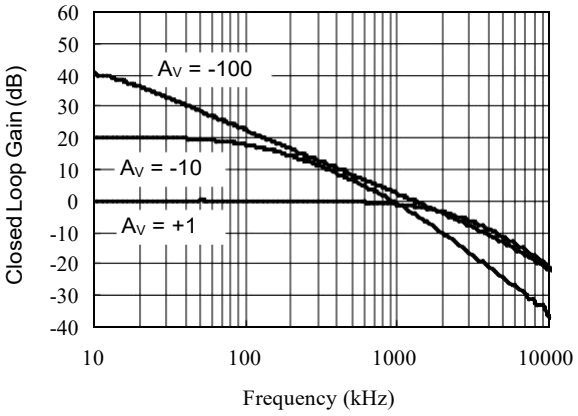
Small Signal Transient Response at +2.5V



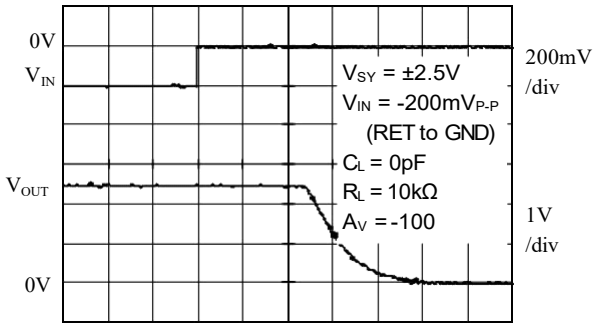
Closed Loop Gain vs. Frequency at +5V



Closed Loop Gain vs. Frequency at +2.5V

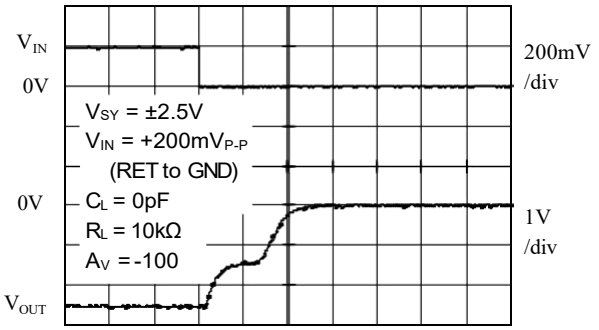


Positive Overvoltage Recovery



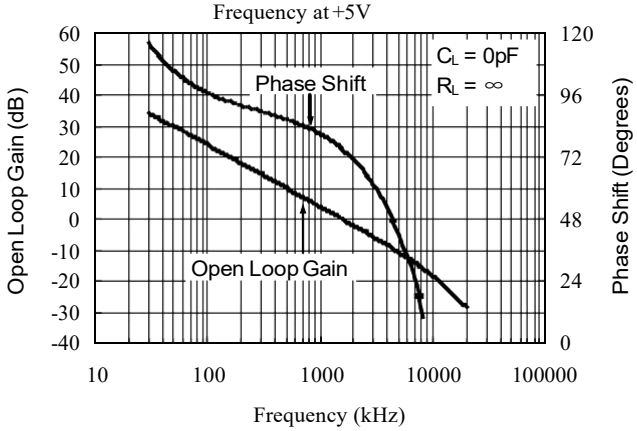
Time (20μs/div)

Negative Overvoltage Recovery

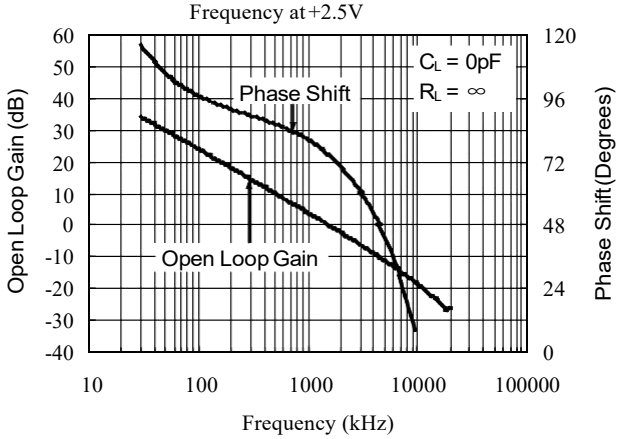


Time (50μs/div)

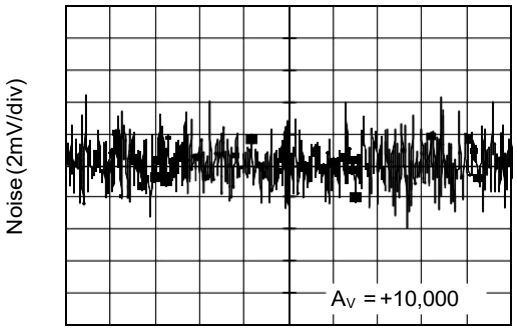
Open Loop Gain, Phase Shift vs. Frequency at +5V



Open Loop Gain, PhaseShift vs. Frequency at +2.5V

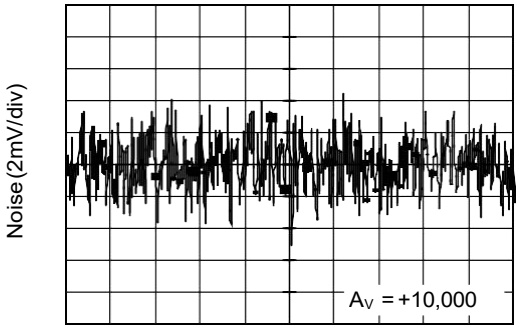


0.1Hz to 10Hz Noise at +5V



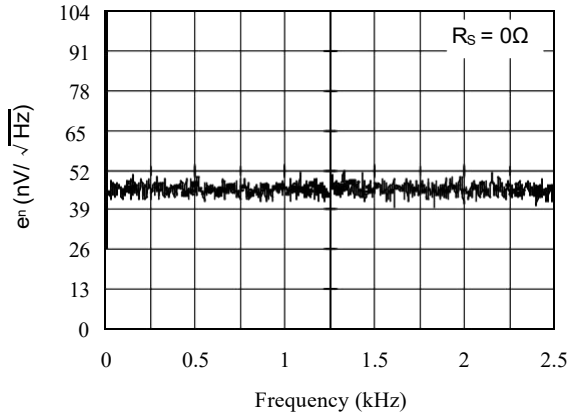
Time (10s/div)

0.1Hz to 10Hz Noise at +2.5V

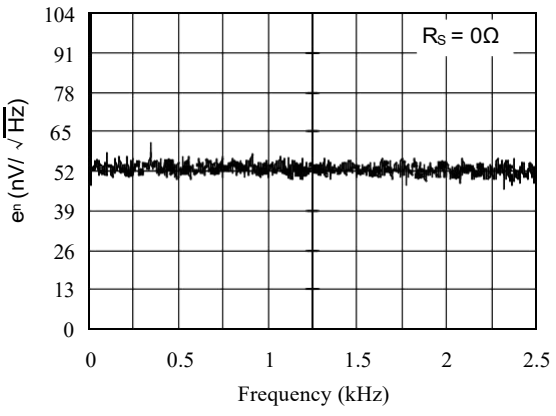


Time (10s/div)

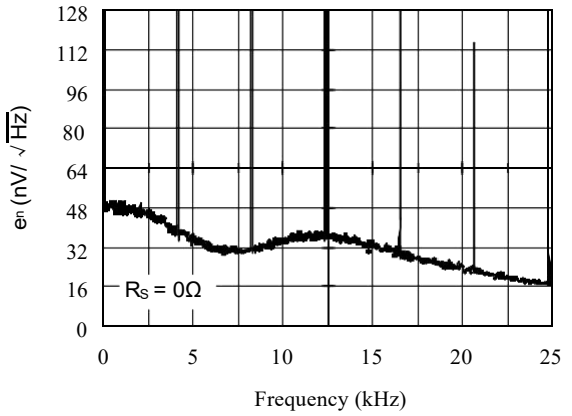
Voltage Noise Density at +5V
from 0.1Hz to 2.5kHz



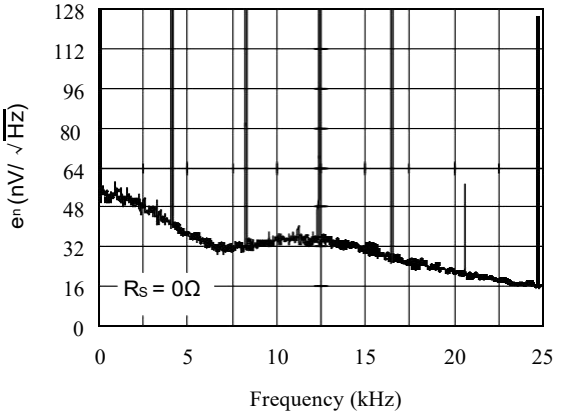
Voltage Noise Density at +2.5V from
0.1Hz to 2.5kHz



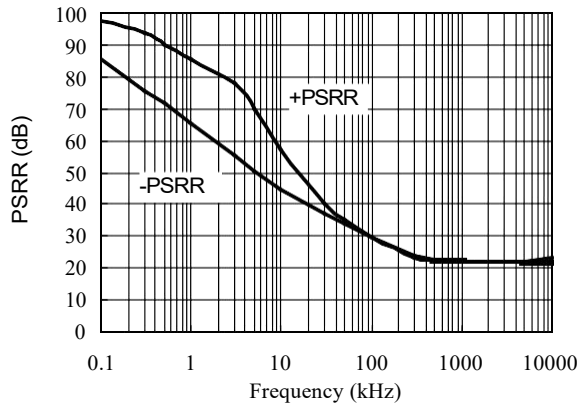
Voltage Noise Density at +5V
from 0.1Hz to 25kHz



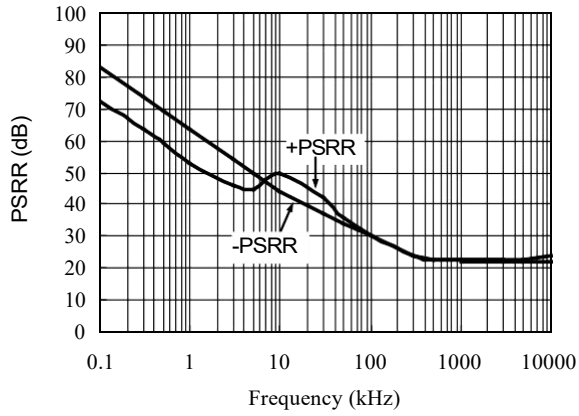
Voltage Noise Density at +2.5V from
0.1Hz to 25kHz



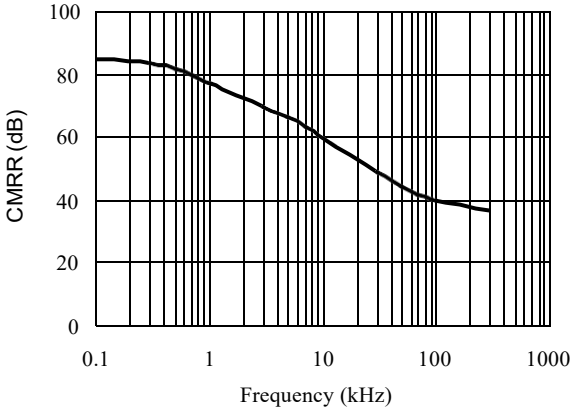
PSRR vs. Frequency at ±2.5V



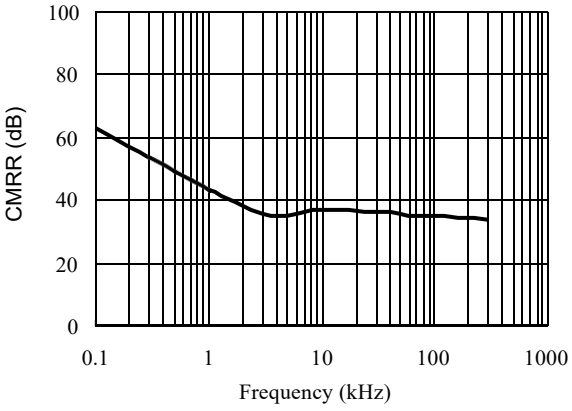
PSRR vs. Frequency at ±1.25V



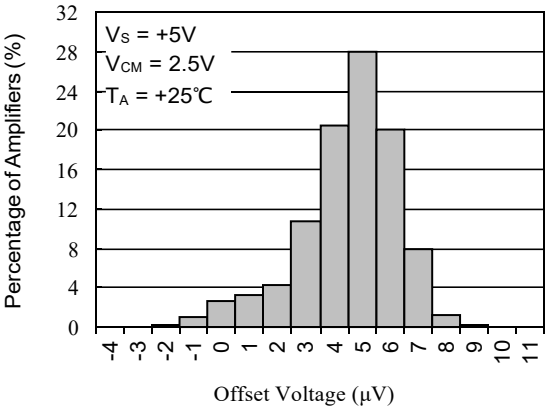
CMRRvs. Frequency at +5V



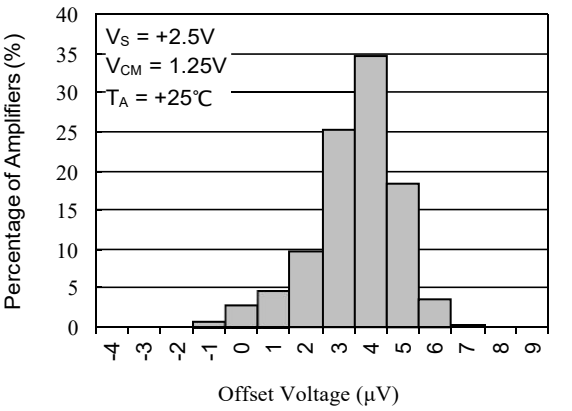
CMRR vs. Frequency at +2.5V



Offset Voltage Production Distribution at +5V

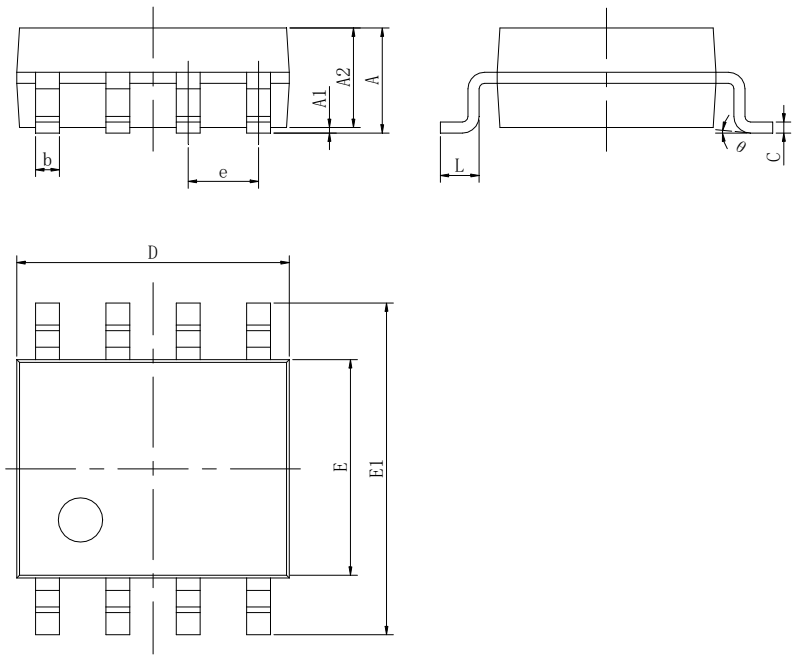


Offset Voltage Production Distribution at +2.5V



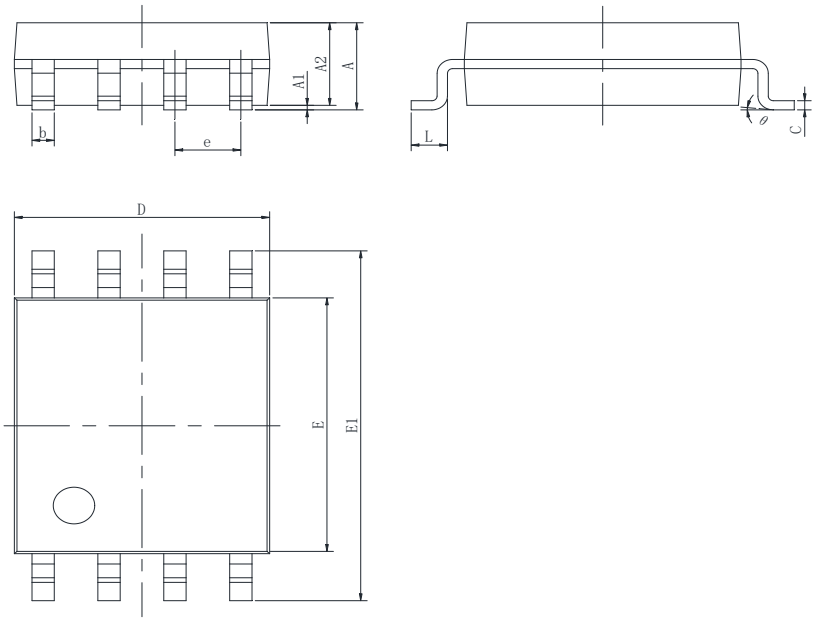
Outline Dimensions

SOP8



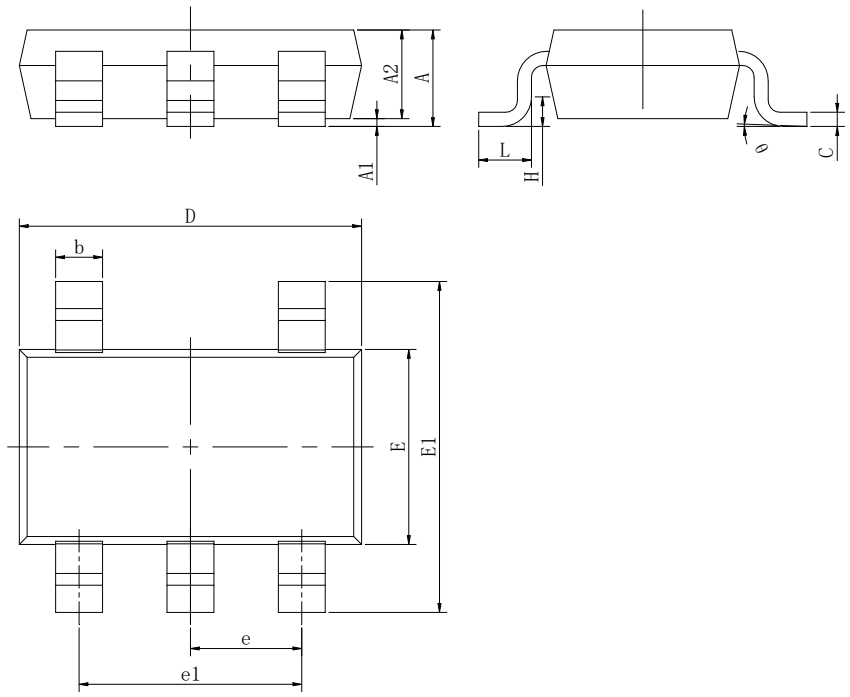
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.000	0.250	0.000	0.010
A2	1.250	1.550	0.053	0.061
b	0.300	0.510	0.011	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)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

MSOP8



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°

SOT23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.050	1.250	0.041	0.049
A1	0.000	0.130	0.000	0.005
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.95（BSC）		0.037(BSC)	
e1	1.90（BSC）		0.075(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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.