Features

- Low Offset Voltage: 20uV(MAX)
- Input Offset Drift: 0.005μV/°C
- High Gain Bandwidth Product: 11MHz
- Rail-to-Rail Input and Output
- High Gain, CMRR, PSRR:120dB(TYP)
- High Slew Rate: 8.5V/μs
- Low Noise:0.48uVp-p(0.1~10Hz)
- Low Power Consumption: 1.3mA/op amp
- Overload Recovery Time:0.4us
- Low Supply Voltage: +2.9 V to +5.5 V
- No External Capacitors Required
- Extended Temperature: -40°C to +125°C

Application

- Temperature Sensors
- Medical/Industrial Instrumentation
- Pressure Sensors
- Battery-Powered Instrumentation
- Active Filtering
- Weight Scale Sensor
- Strain Gage Amplifiers
- Power Converter/Inverter

Description

The CBM8561, CBM8562, CBM8564, (dual version &shutdown) series of CMOS operational amplifiers use auto-zero techniques to simultaneously provide very low offset voltage (20μV max) and near-zero drift over time and temperature. This family of amplifiers has ultralow noise, offset and power.

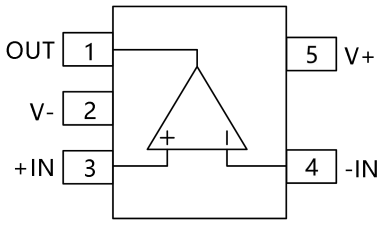
This miniature, high-precision operational amplifiers offset high input impedance and rail-to-rail input and rail-to-rail output swing. With high gain-bandwidth product of 11MHz and slew rate of 8.5V/μs.

Single or dual supplies as low as +2.9V (±1.45V) and up to +5.5V (±2.75V) may be used.

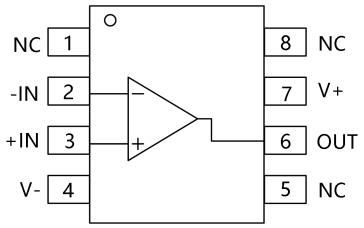
The CBM8561/CBM8562/CBM8564 (dual version with shutdown) are specified for the extended industrial and automotive temperature range (-40°C to 125°C). The CBM8561 single amplifier is available in 5-lead SOT23, 8-lead MSOP8 and 8-lead SOIC packages, The CBM8562 dual amplifier is available in 8-lead SOIC and 8-lead MSOP narrow surface mount packages, The CBM8564 quad is available in 14-lead SOIC and 14-lead narrow TSSOP packages.

CATALOG

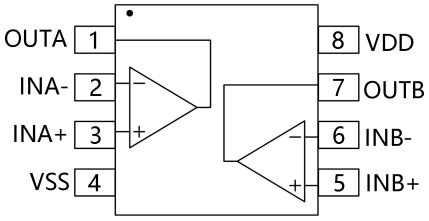
Pin Configurations



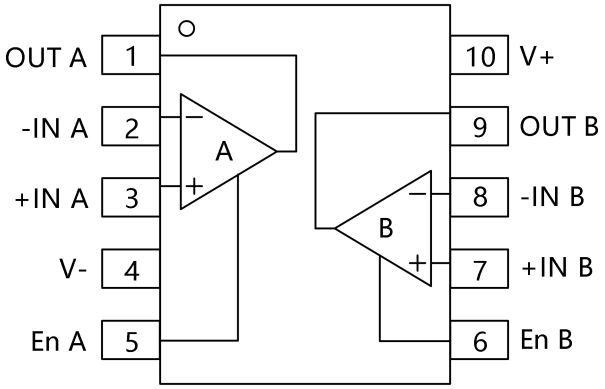
SOT23-5



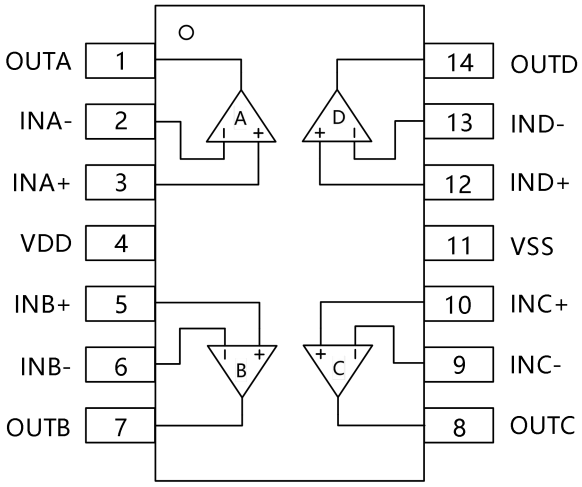
SOIC-8(SOP8),MSOP-8



SOIC-8(SOP8),MSOP-8



MSOP-10



SOIC-14(SOP14),TSSOP-14

Note : NC indicates no internal connection

Absolute Maximum Ratings [1]

- Supply Voltage, V+ to V- : 7.0V
- Input Terminals, Voltage (2) : – 0.5 to (V+) + 0.5V
- Current (2) : ±10mA
- Storage Temperature : −65°C to +150°C
- Junction Temperature : 150°C
- Package Thermal Resistance @ TA= +25°C
- Operating Temperature : −40°C to +125°C
- SOT23-5, SOT23-6 : 200°C/W
- MSOP-8, SOIC-8 : 150°C/W
- SOIC-14, TSSOP-14 : 100°C/W
- Lead Temperature (Soldering, 10s) : 260°C

ESD Susceptibility

- HBM : 5000V
- MM : 400V

1.Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

2.Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

ESD SENSIYIVITY CAUTION

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

Electrical Characteristics

Boldface limits apply over the specified temperature range, T_A = –40°C to +125°C.

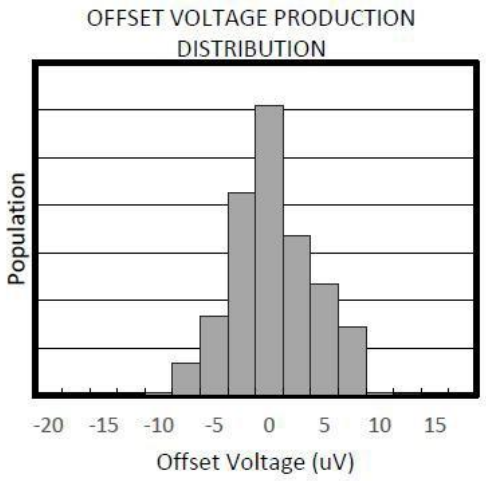
(At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, and VOUT = $V_S/2$, unless otherwise noted.)

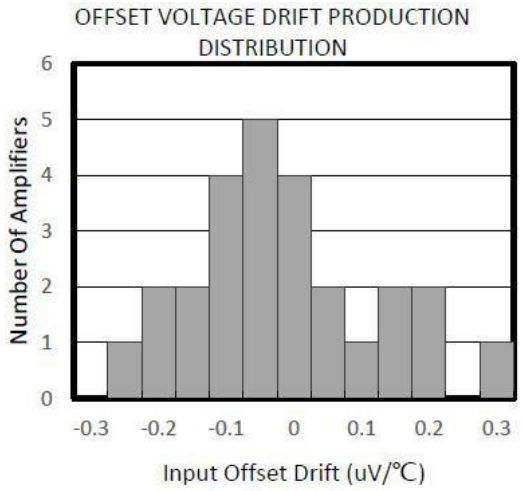
PARAMETER	CONDITION	CBM8561,CBM8562,CBM8564			
		MIN	TYP	MAX	UNIT
OFFSET VOLTAGE					
Input Offset Voltage (V_{OS})	V_{CM} = Vs/2		±3	±20	μV
VS Temperature (dVos/dT)			0.1	0.4	μV/°C
VS Power Supply (PSRR)	V_S = +2.9V to +5.5V, V_{CM} = 0	110	120		dB
Channel Separation, dc			0.1		μV/V
INPUT BIAS CURRENT					
Input Bias Current (I_B)	V_{CM} = Vs/2		100		pA
Input Offset Current (Ios)			10		pA
NOISE PERFORMANCE					
Input Voltage Noise (e_np-p)	f=0.01Hz to 10Hz		0.48		μVpp
Input Voltage Noise (e_np-p)	f=0.01Hz to 1Hz		0.15		uVpp
Input Voltage Noise Density (e_n)	f=1KHz		32		$nV/\sqrt{Hz}$
Input Current Noise Density (i_n)	f=10Hz		1.5		$fA/\sqrt{Hz}$
INPUT VOLTAGE RANGE					
Common-Mode Voltage Range (V_{CM})		(V-)-0.1		(V+)+0.1	V
Common-Mode Rejection Ratio (CMRR)	(V–) – 0.1V < V_{CM} < (V+)+ 0.1V	100	120		dB
INPUT CAPACITANCE					
Differential			5		pF
Common-Mode			5		pF
OPEN-LOOP GAIN					
Open-Loop Voltage Gain (A_{OL})	R_L=10KΩ,VO=0.3Vto4.7V,-40°C~125°C	100	120		dB
DYNAMIC PERFORMANCE					
Slew Rate (SR)	G=+1		8.5		V/μs
Gain-Bandwidth Product (GBW)			11		MHz
Overload Recovery Time			0.4		us
OUTPUT CHARACTERISTICS					

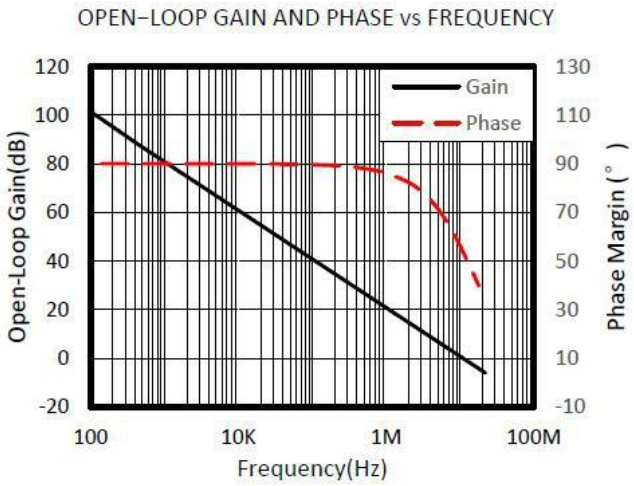
Output Voltage High（V_{OH}）	R_L=100 KΩ to GND	4.99	4.998		V
	R_L=10 KΩ to GND	4.95	4.98		V
Output Voltage Low（V_{OL}）	R_L=100 KΩ to V+		1	10	mV
	R_L=10 KΩ to V+		10	30	mV
Short-Circuit Current（I_{SC}）			65		mA
POWER SUOOLY					
Operating Voltage Range		2.9		5.5	V
Quiescent Current（I_Q）			1.3	1.55	mA
SHUTDOWN					
T_{OFF}			2		μs
T_{ON}			150		us
V_L (shutdown)		0		+0.8	V
V_H (amplifier is active)		0.75(V+)		V+	V
Input Bias Current of Enable Pin			50		pA
I_{QSD}			1	5	uA

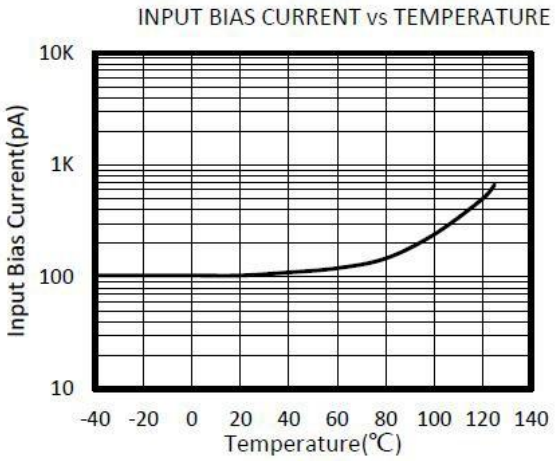
Typical Characteristics

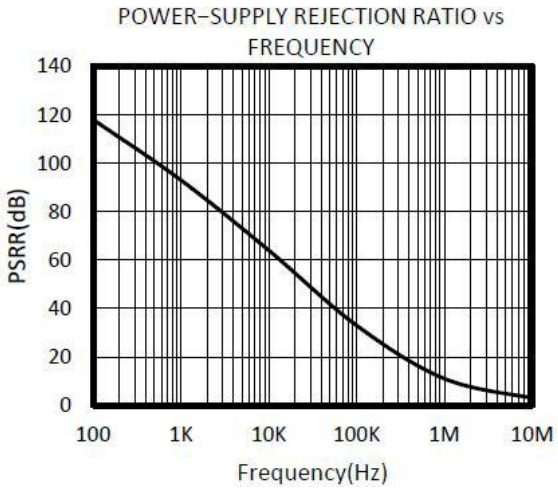
At T_A = +25℃, Vs=5V, R_L = 10kΩ connected to $V_S/2$, VOUT = $V_S/2$, unless otherwise noted.

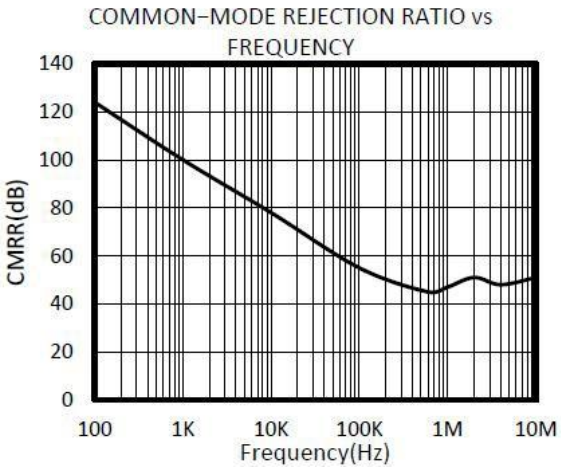








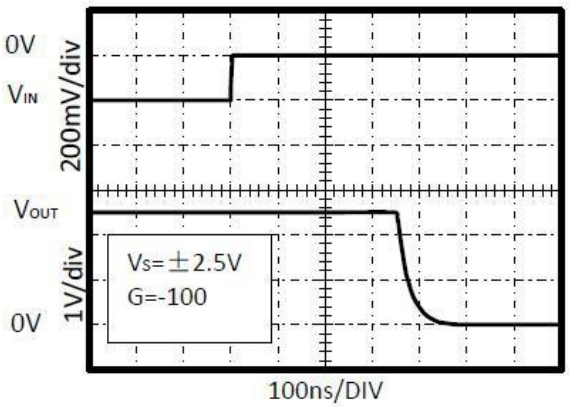




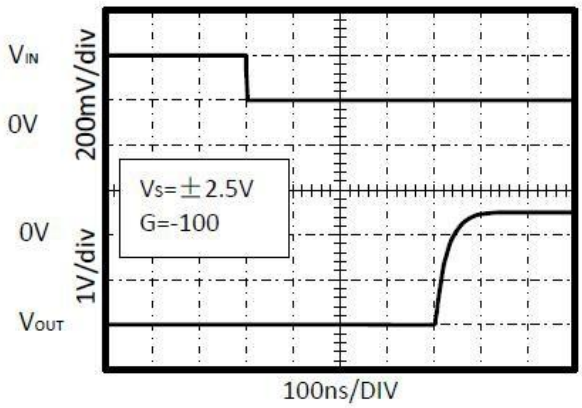
Typical Characteristics

T_A=+25℃ Vs=5V, R_L=10 kΩ connected to V_S/2 and VOUT= V_S/2, unless otherwise noted.

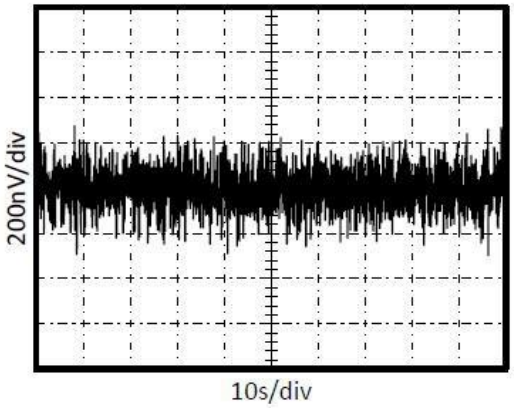
POSITIVE OVERVOLTAGE RECOVERY



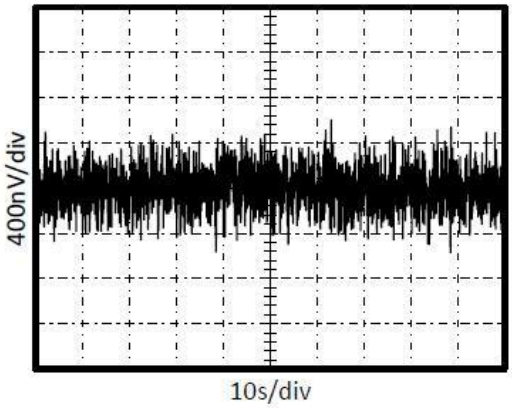
NEGATIVE OVERVOLTAGE RECOVERY



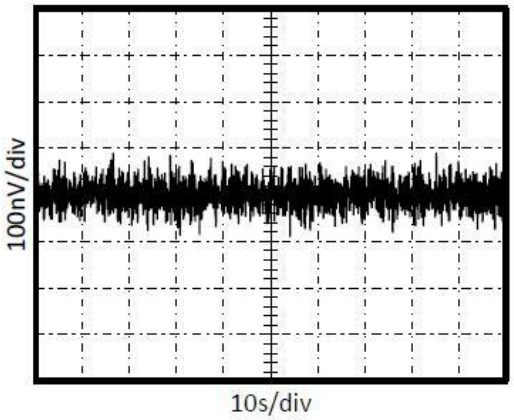
0.01Hz TO 10Hz NOISE AT Vs=5V



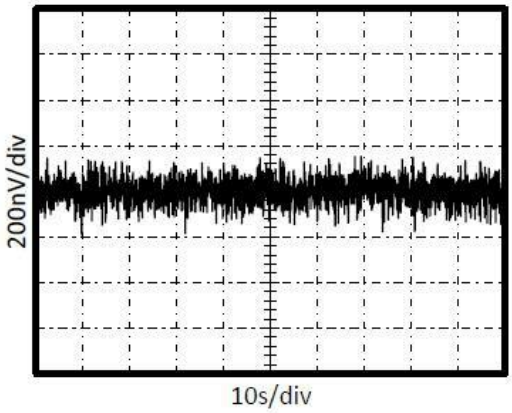
0.01Hz TO 10Hz NOISE AT Vs=2.9V



0.01Hz TO 1Hz NOISE AT Vs=5V

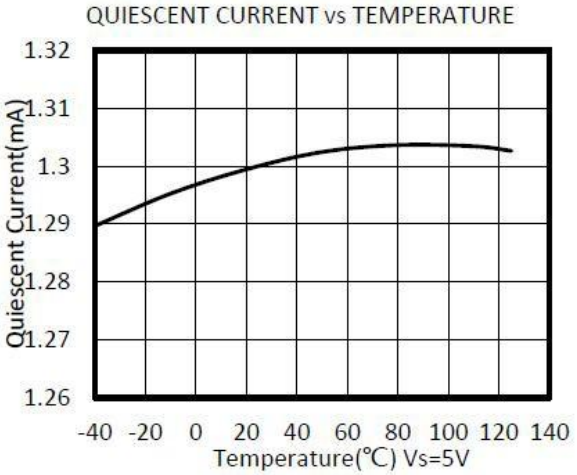


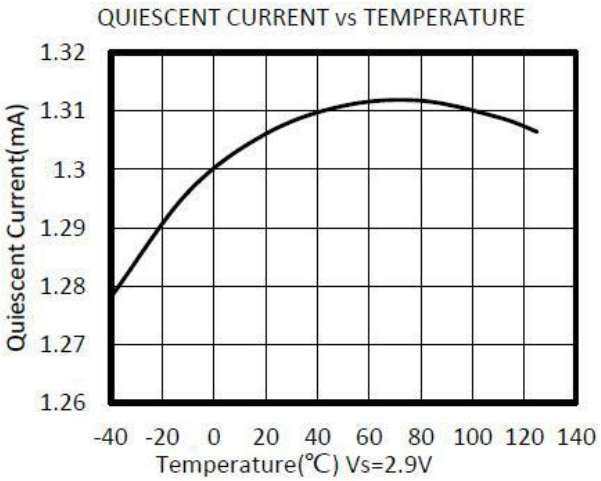
0.01Hz TO 1Hz NOISE AT Vs=2.9V

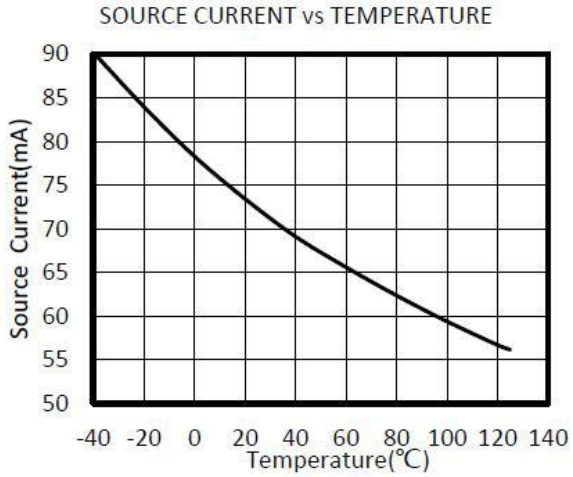


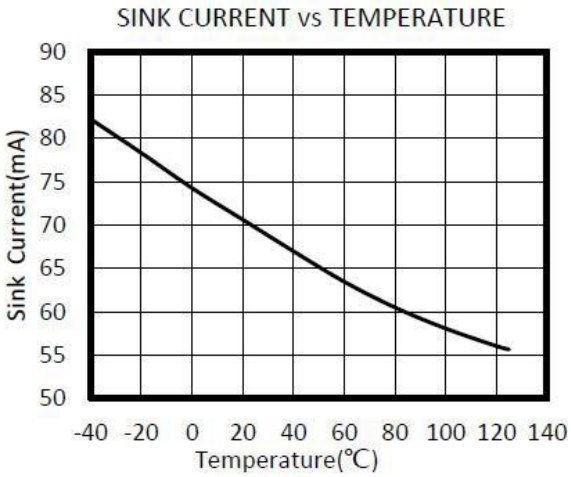
Typical Characteristics

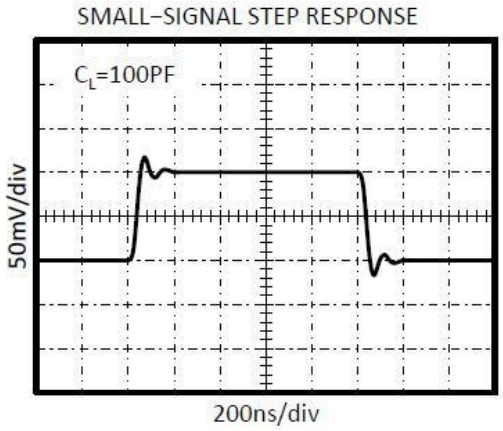
At T_A=+25℃, Vs=5V, R_L=10kΩ connected to V_S/2, VOUT=V_S/2, unless otherwise noted.

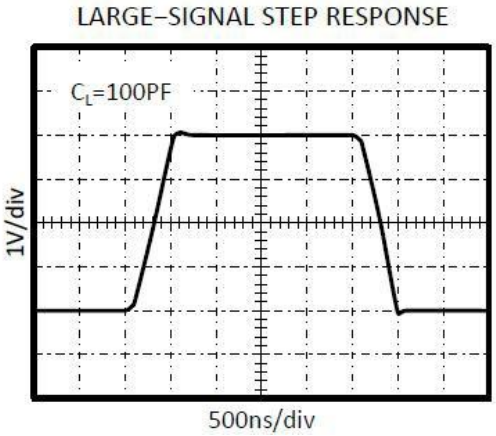












Application Notes

The CBM8561, CBM8562, CBM8564 series op amps are unity-gain stable and free from unexpected output phase reversal. They use auto-zeroing techniques to provide low offset voltage and very low drift over time and temperature.

Good layout practice mandates use of a 0.1μF capacitor placed closely across the supply pins.

For lowest offset voltage and precision performance, circuit layout and mechanical conditions should be optimized. Avoid temperature gradients that create thermoelectric (Seebeck) effects in thermocouple junctions formed from connecting dissimilar conductors. These thermally-generated potentials can be made to cancel by assuring that they are equal on both input terminals.

Use low thermoelectric-coefficient connections (avoid dissimilar metals).

Thermally isolate components from power supplies or other heat-sources.

Shield op amp and input circuitry from air currents, such as cooling fans.

Following these guidelines will reduce the likelihood of junctions being at different temperatures, which can cause thermoelectric voltages of 0.1μV/°C or higher, depending on materials used.

Operating Voltage

The CBM8561, BM8562,CBM8564 series op amps operate over a power-supply range of +2.9V to +5.5V (±1.45V to ±2.75V). Supply voltages higher than 7V (absolute maximum) can permanently damage the amplifier. Parameters that vary over supply voltage or temperature are shown in the Typical Characteristics section of this data sheet.

Layout Guidelines

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1μF capacitor closely across the supply pins. These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI (electromagnetic-interference) susceptibility.

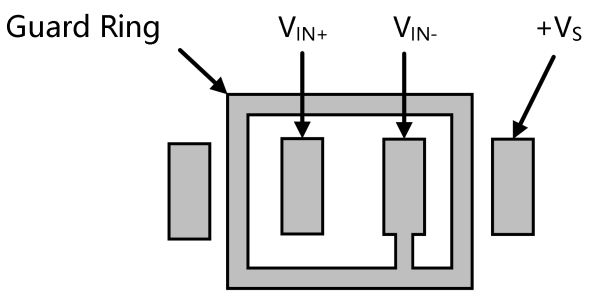
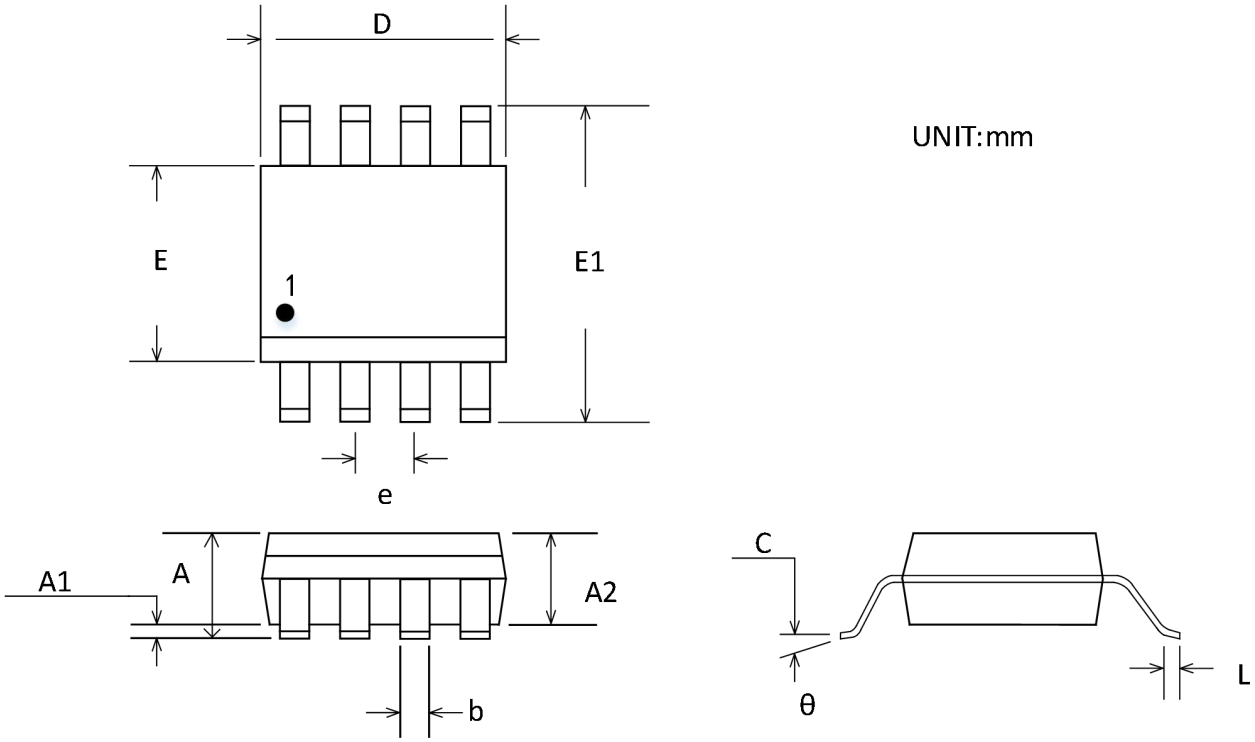


Figure 1. The Layout of Guard Ring

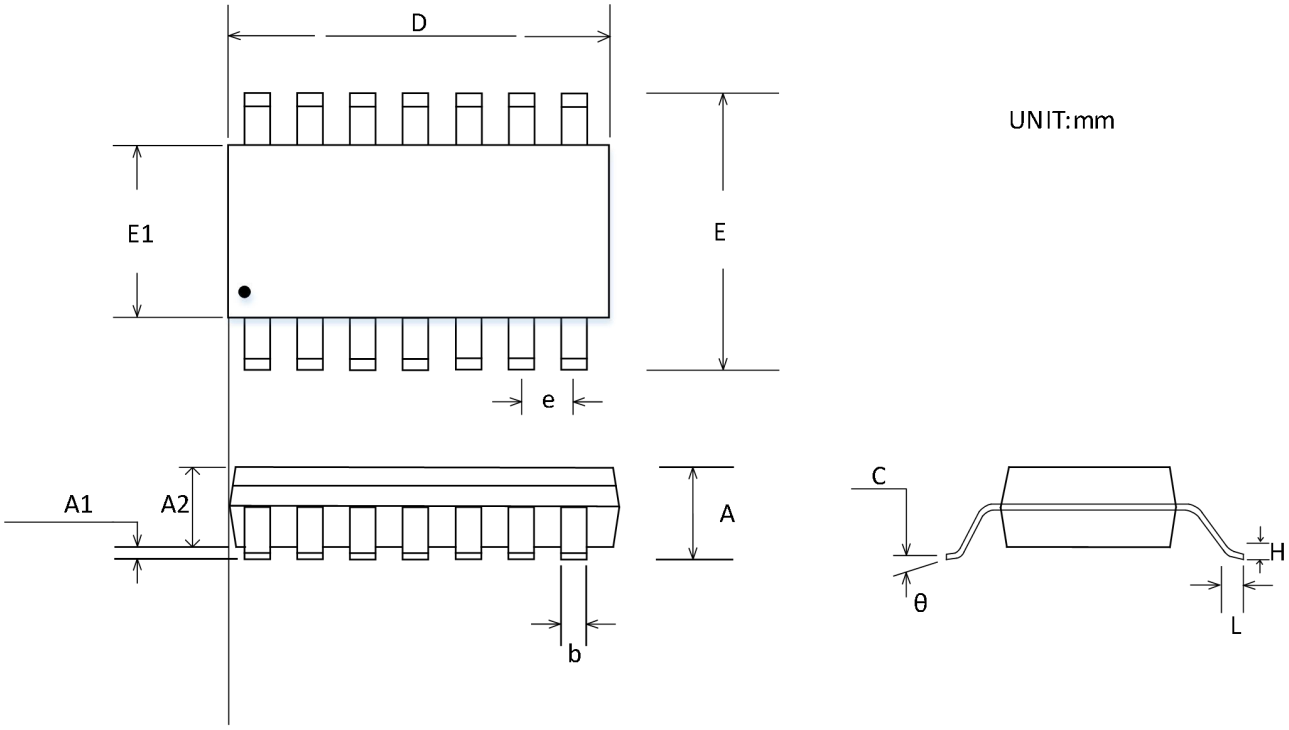
Package Outline Dimensions

MSOP-8



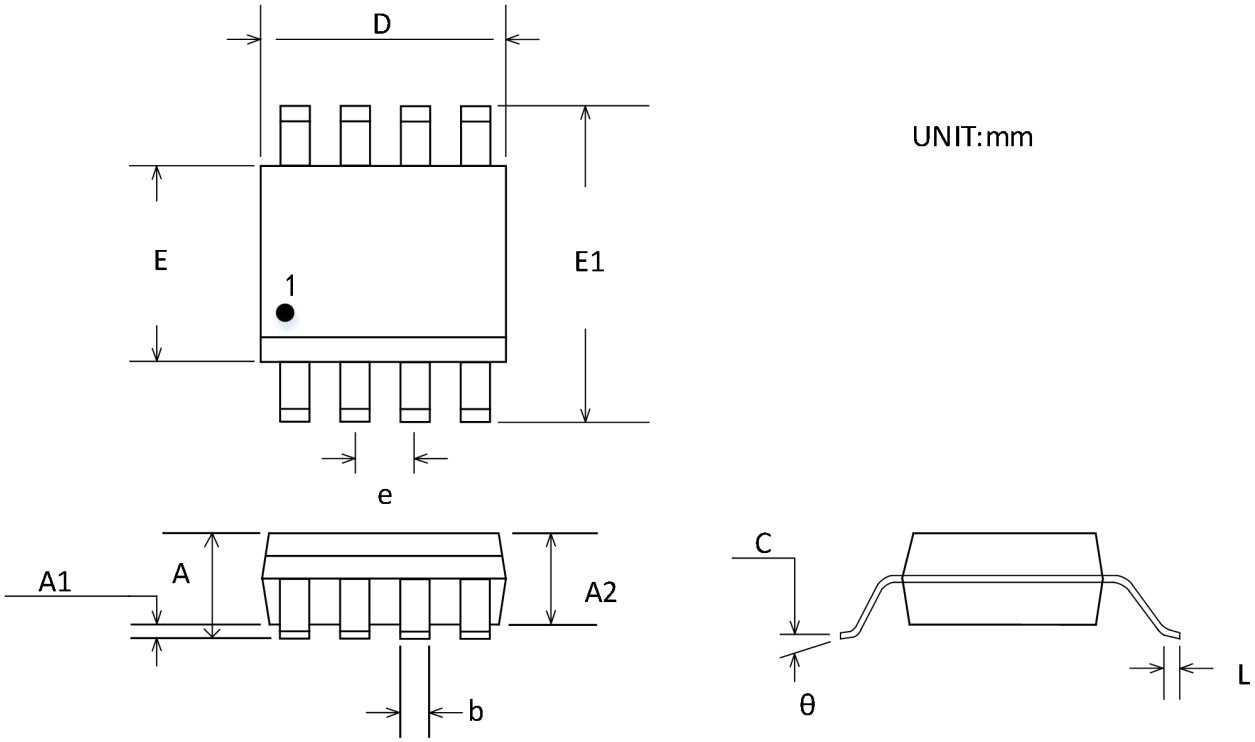
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC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

TSSOP-14



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.020	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

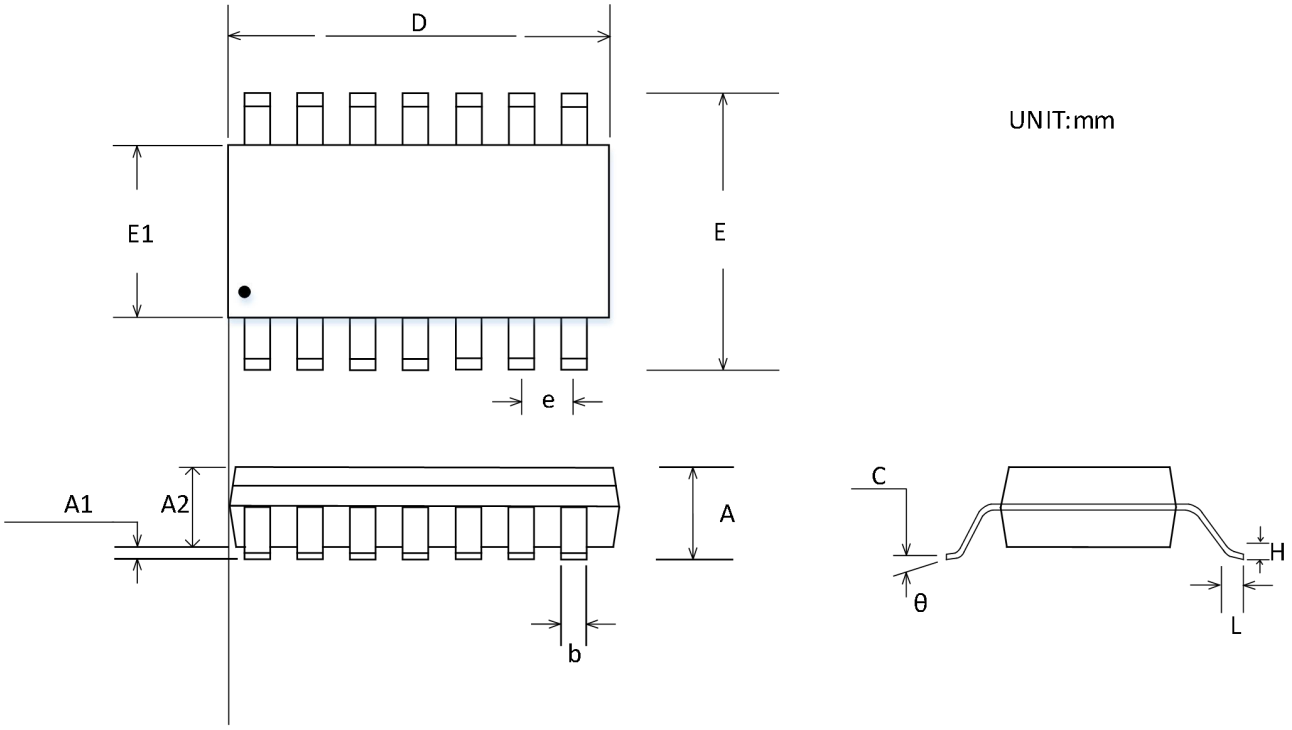
SOP8



UNIT:mm

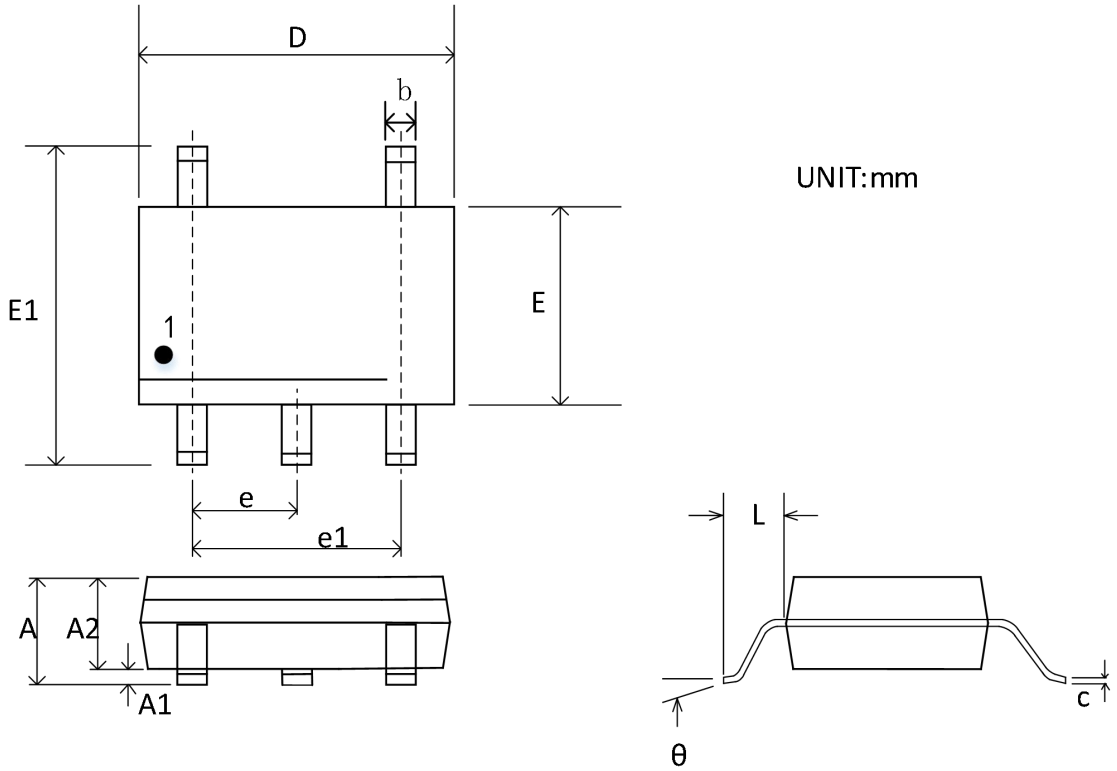
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOIC-14(SOP14)



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOT23-5



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
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	0.950 BSC		0.037 BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Package/Ordering Information

CHANNEL	ORDERING NUMBER	PACKAGE DESCRIPTION	MAKING INFORMATION	PAKEAGE OPTION
Single	CBM8561AST5	SOT23-5	8651	Tape and Reel, 3000
Single	CBM8561AS8	SOP-8	CBM8561A	Tape and Reel, 2500
Single	CBM8561AS8-RL	SOP-8	CBM8561A	Tape and Reel, 3000
Single	CBM8561AS8-REEL	SOP-8	CBM8561A	Tape and Reel, 4000
Dual	CBM8562AS8	SOP-8	CBM8562A	Tape and Reel, 2500
Dual	CBM8562AS8-RL	SOP-8	CBM8562A	Tape and Reel, 3000
Dual	CBM8562AS8-REEL	SOP-8	CBM8562	Tape and Reel, 4000
Dual	CBM8562AMS8	MSOP-8	M62	Tape and Reel, 3000
Quad	CBM8564AS14	SOP-14	CBM8564AS	Tape and Reel, 2500
Quad	CBM8564AS14-RL	SOP-14	CBM8564AS	Tape and Reel, 3000
Quad	CBM8564AS14-REEL	SOP-14	CBM8564AS	Tape and Reel, 4000
Quad	CBM8564ATS14	TSSOP-14	CBM8564AT	Tape and Reel, 2500
Quad	CBM8564ATS14-RL	TSSOP-14	CBM8564AT	Tape and Reel, 3000
Quad	CBM8564ATS14-RL	TSSOP-14	CBM8564AT	Tape and Reel, 4000