

Features

- HIGH GAIN BANDWIDTH:10MHz
- RAIL-TO-RAIL INPUT AND OUTPUT 0.9mV
Typical V_{OS}
- INPUT VOLTAGE RANGE: -0.1V to +5.6V
with $V_s = 5.5V$
- SUPPLY RANGE: +2.5V to +5.5V
- SHUTDOWN: CBMV721S/CBMV722S
- SPECIFIED UP TO +125°C
- MicroSIZE PACKAGES: SOT23-5, SOT23-6

Application

- SENSORS
- PHOTODIODE AMPLIFICATION
- ACTIVE FILTERS
- TEST EQUIPMENT
- DRIVING A/D CONVERTERS

Description

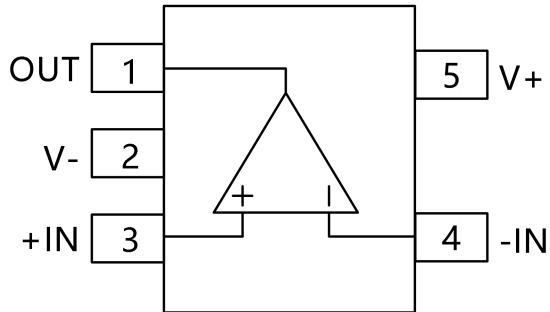
The CBMV72X families of products offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (10MHz) and slew rate of 7V/us. The op-amps are unity gain stable and feature an ultra-low input bias current.

The devices are ideal for sensor interfaces, active filters and portable applications. The CBMV721S, CBMV722S include a shutdown mode. Under logic control, the amplifiers can be switched from normal operation to a standby current that is less than 1uA. The CBMV72X families of operational amplifiers are specified at the full temperature range of -40°C to +125°C under single or dual power supplies of 2.5V to 5.5V.

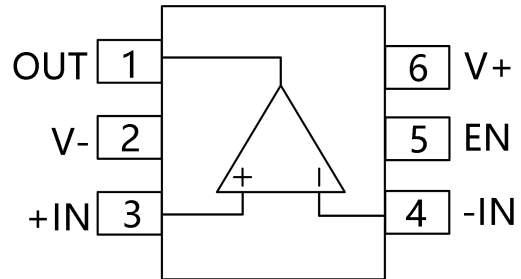
CATALOG

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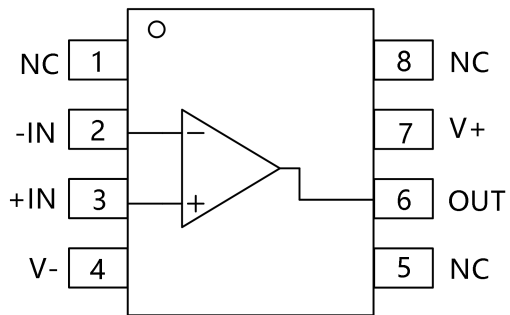
Pin Configurations



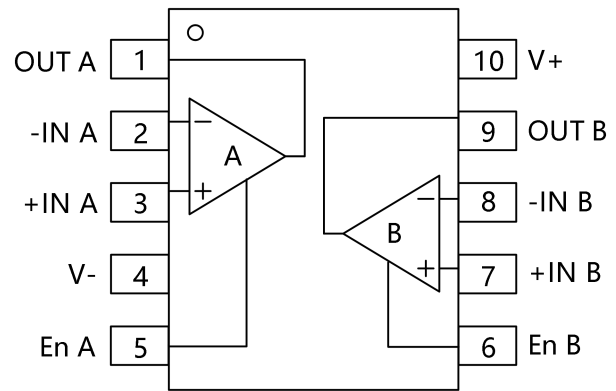
SOT23-5



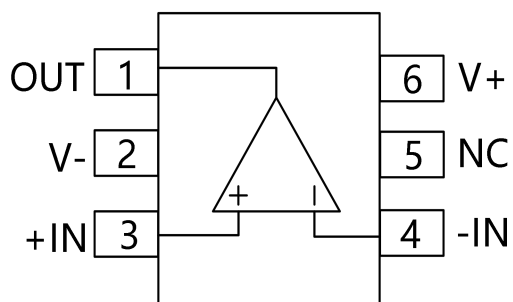
SOT23-6



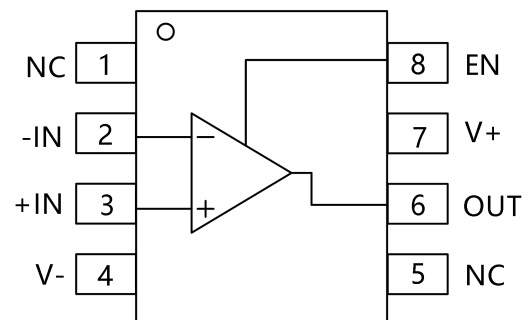
SOIC-8(SOP8) , MSOP-8



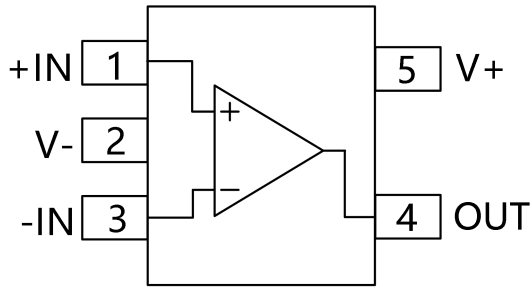
MSOP-10



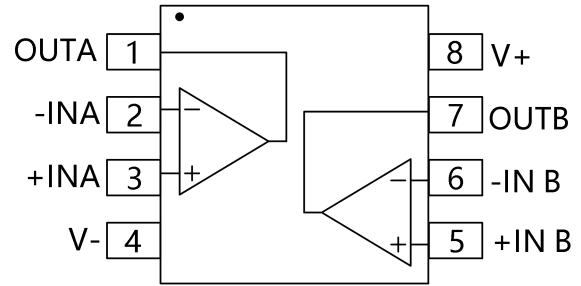
TDFN2x2-6



SOIC-8(SOP8)

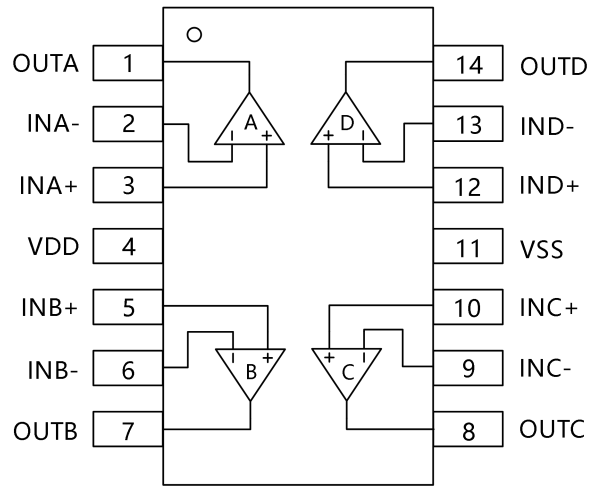


SOT23-5



**SOIC-8(SOP8),MSOP-8
TDFN2x2-8, TDFN3x3-8**

Note : NC indicates no internal connection



SOIC-14(SOP14),TSSOP-14

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
•	Operating Temperature	-40°C to +125°C
•	Junction Temperature	150°C
•	Package Thermal Resistance @ T _A = +25°C	
•	OT23-5, SOT23-6	200°C/W
•	SOP-10, SOIC-8, TSSOP-8	150°C/W
•	SOIC-14, TSSOP-14	100°C/W
•	Lead Temperature (Soldering, 10s)	260°C ESD Susceptibility
•	BM	5000V
•	M	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 SENSIVIVITY 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

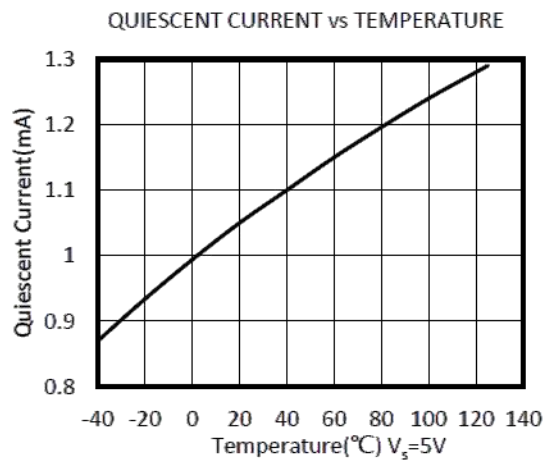
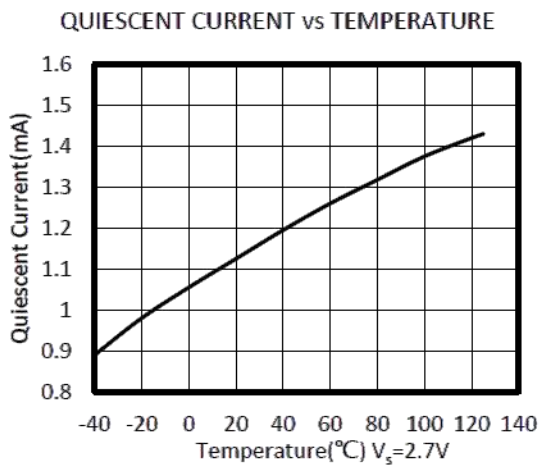
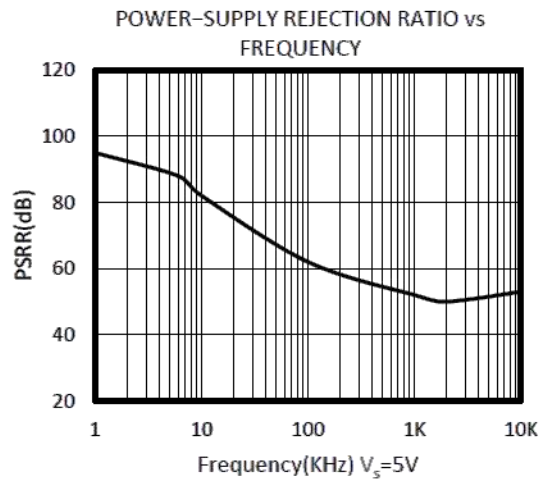
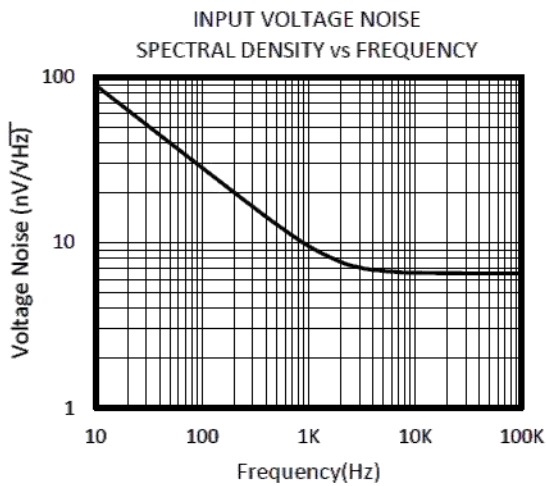
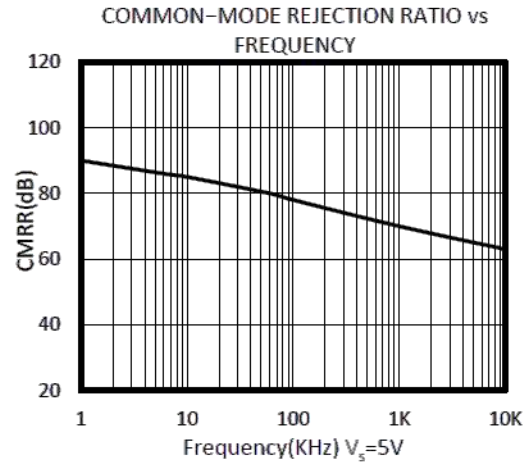
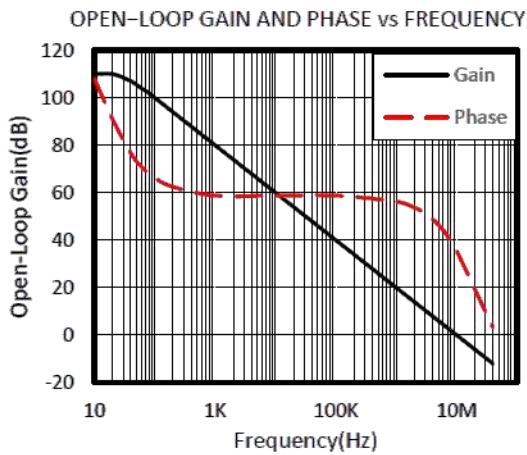
(At $T_A = +25^\circ\text{C}$, $V_S=5\text{V}$, $R_L = 10\text{k}\Omega$ connected to $V_S/2$, and $V_{OUT} = V_S/2$, unless otherwise noted.)

PARAMETER	CONDITIONS	T_J	CBMV721S,CBMV722S CBMV721,CBMV722, CBMV724			UNIT	
			MIN	TYP	MAX		
POWER SUPPLY							
V_S	Operating Voltage Range		25°C	2.5		5.5	V
I_Q	Quiescent Current/Amplifier		25°C		1.15	1.4	μA
PSRR	Power-Supply Rejection Ratio	$V_S=2.5\text{V to }5.5\text{V}$, $V_{CM}=(V_-)+0.5\text{V}$	25°C	75	85		dB
			-40°C to 125°C	65			
INPUT							
V_{OS}	Input Offset Voltage		25°C		0.5	2.5	mV
$V_{OS T_C}$	Input Offset Voltage Average Drift	-40°C to 125°C			2.6		$\mu\text{V}/^\circ\text{C}$
I_B	Input Bias Current		25°C		1	10	μA
I_{OS}	Input Offset Current		25°C		1	10	μA
V_{CM}	Common-Mode Voltage Range	$V_S= 5.5\text{V}$	25°C	-0.1		5.6	V
CMRR	Common-Mode Rejection Ratio	$V_S= 5.5\text{V}$, $V_{CM}=-0.1\text{V to }4\text{V}$	25°C	73	85		dB
			-40°C to 125°C	67			
			25°C	60	75		
			-40°C to 125°C	57			
OUTPUT							
A_{OL}	Open-Loop Voltage Gain	$R_L=2\text{k}\Omega$, $V_O=0.15\text{V to }4.85\text{V}$	25°C	86	95		dB
			-40°C to 125°C	65			
			25°C	90	96		
			-40°C to 125°C	66			
	Output Swing From Rail	$R_L=2\text{k}\Omega$	25°C		52		mV
				$R_L=10\text{k}\Omega$		7	
I_{OUT}	Output Short-Circuit Current		25°C		70		mA

FREQUENCY RESPONSE							
S_R	Slew Rate		25°C		7		V/us
GBP	Gain-Bandwidth Product		25°C		10		MHz
P_M	Phase Margin		25°C		62		°
T_S	Setting Time,0.1%				0.2		us
	Overload Recovery Time	$V_{IN} \cdot Gain \geq V_S$			0.35		us
NOISE							
e_n	Input Voltage Noise Density	$f = 1\text{KHz}$	25°C		9.5		nV/\sqrt{Hz}
		$f = 10\text{KHz}$	25°C		6.5		nV/\sqrt{Hz}
ENABLE/SHUTDOWN(CBM8541,CBM8542)							
$I_{Q(OFF)}$	Supply Current in Shutdown		25°C		<1		uA
T_{OFF}			25°C		3		us
T_{ON}			25°C		20		us
V_L	Shut Down		25°C	V-		(V-)+0.8	V
V_H	Amplifier Is Active		25°C	(V-)+2		V+	V

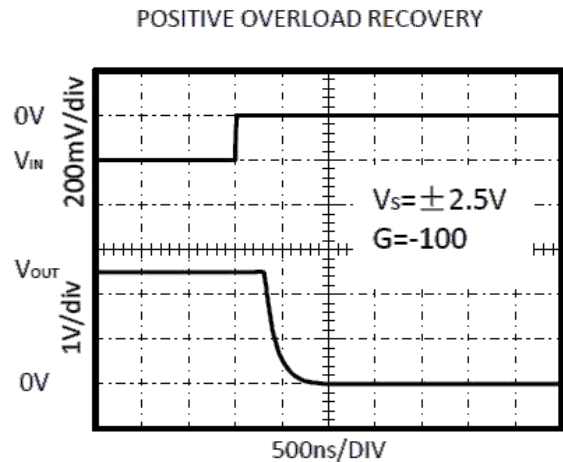
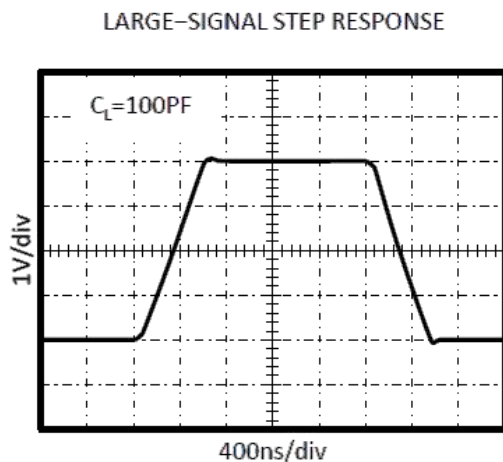
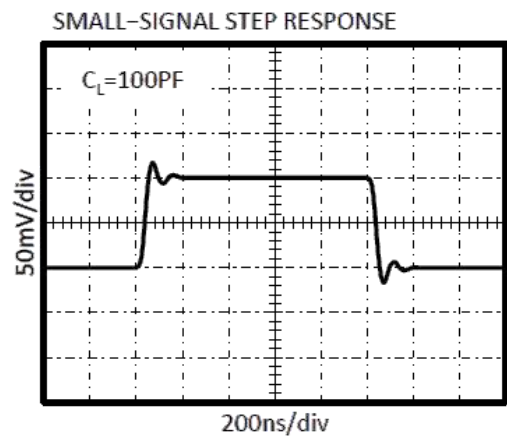
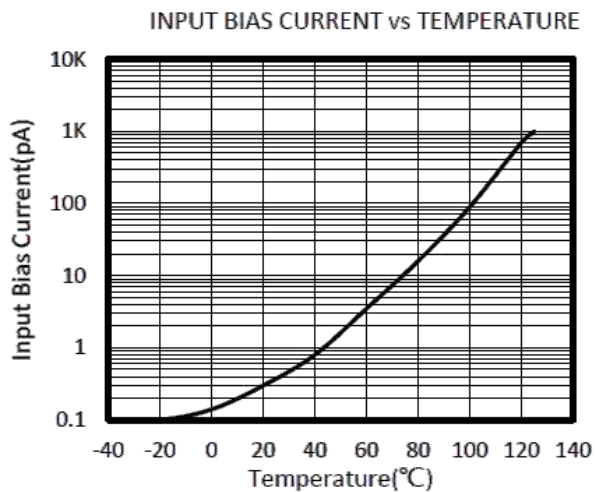
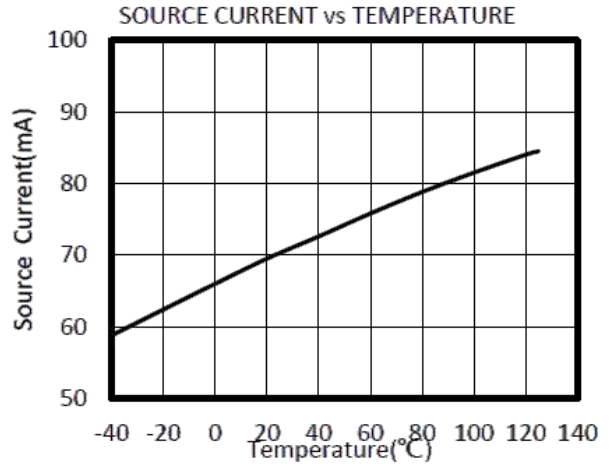
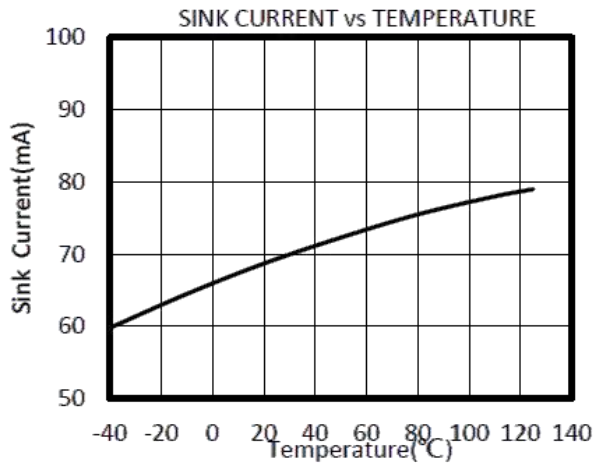
Typical Characteristics

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $R_L = 10\text{k}\Omega$ connected to $V_S/2$, $V_{OUT} = V_S/2$, unless otherwise noted.



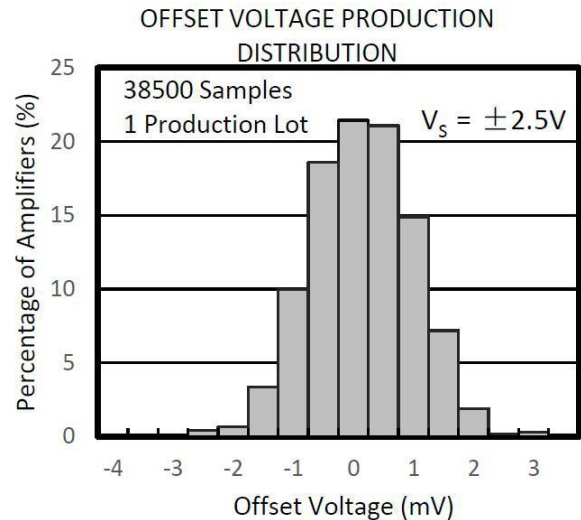
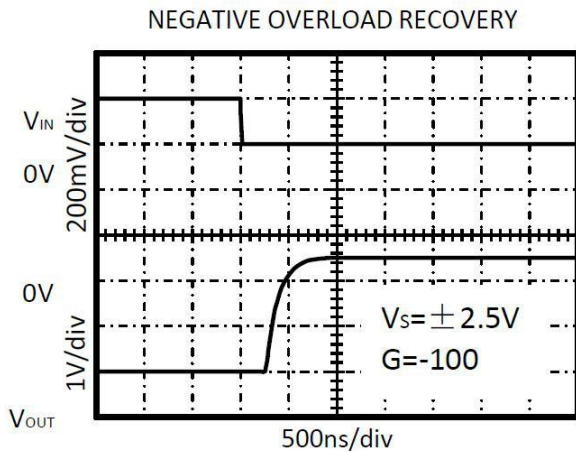
Typical Characteristics

AT $T_A = +25^\circ\text{C}$ $V_S = 5\text{V}$, $R_L = 10\text{ k}\Omega$ connected to $V_S/2$ and $V_{OUT} = V_S/2$, unless otherwise noted.



Typical Characteristics

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $R_L = 10\text{k}\Omega$ connected to $V_S/2$, $V_{OUT} = V_S/2$, unless otherwise noted.



Application Notes

The CBMV721, CBMV722, CBMV724, CBMV721S, CBMV722S are high precision, rail-to-rail operational amplifiers that can be run from a single-supply voltage 2.5V to 5.5V ($\pm 1.25\text{V}$ to $\pm 2.75\text{V}$). Supply voltages higher than 7V (absolute maximum) can permanently damage the amplifier.

Rail-to-rail input and output swing significantly increases dynamic range, especially in low-supply applications.

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

CBMV721S/CBMV722S ENABLE FUNCTION

The CBMV721S/CBMV722S includes a shutdown mode. Under logic control, the amplifiers can be switched from normal mode to a standby current of 1 μA . When the Enable pin is connected to high, the amplifier is active. Connecting Enable low disables the amplifier, and places the amplifier, and place the output in a high-impedance state.

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 0.1uF 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 susceptibility.

Instrumentation Amplifier

In the three-op amp, instrumentation amplifier configuration shown in Figure2.

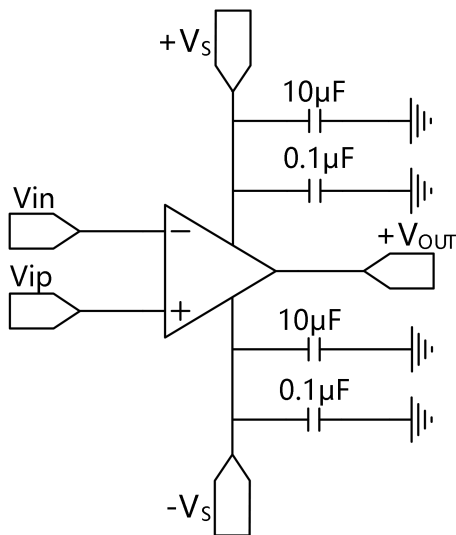


Figure 1. Amplifier with Bypass Capacitors

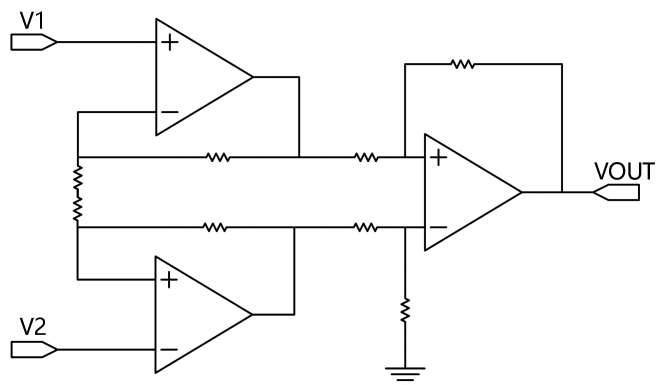
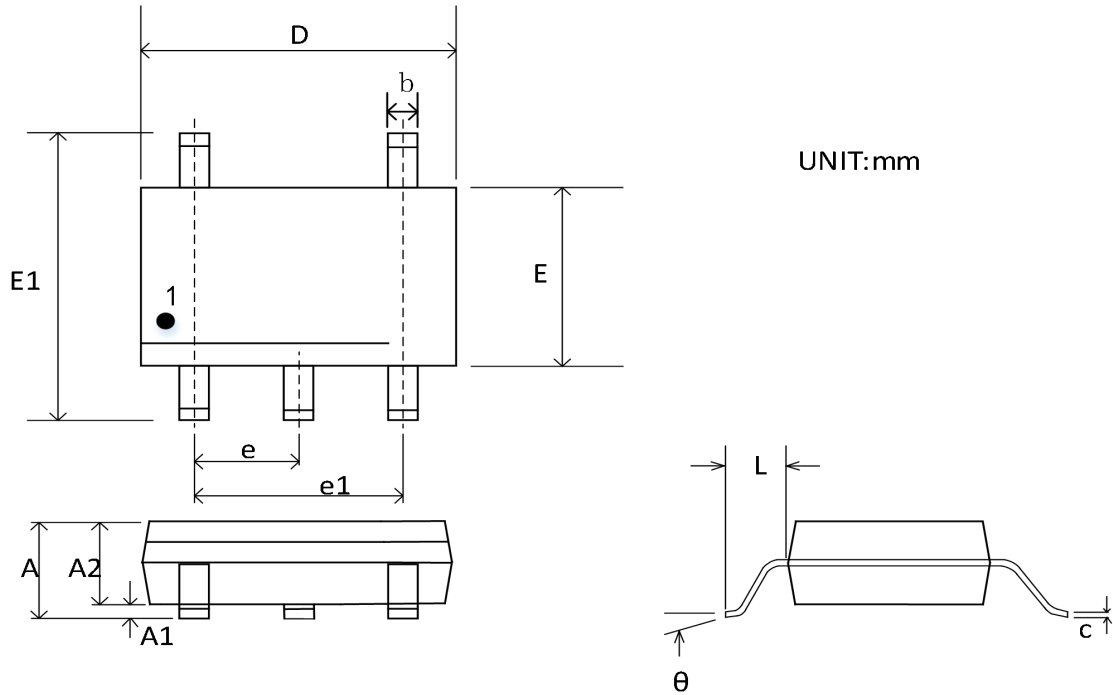


Figure2. Amplifier instrumentation amplifier

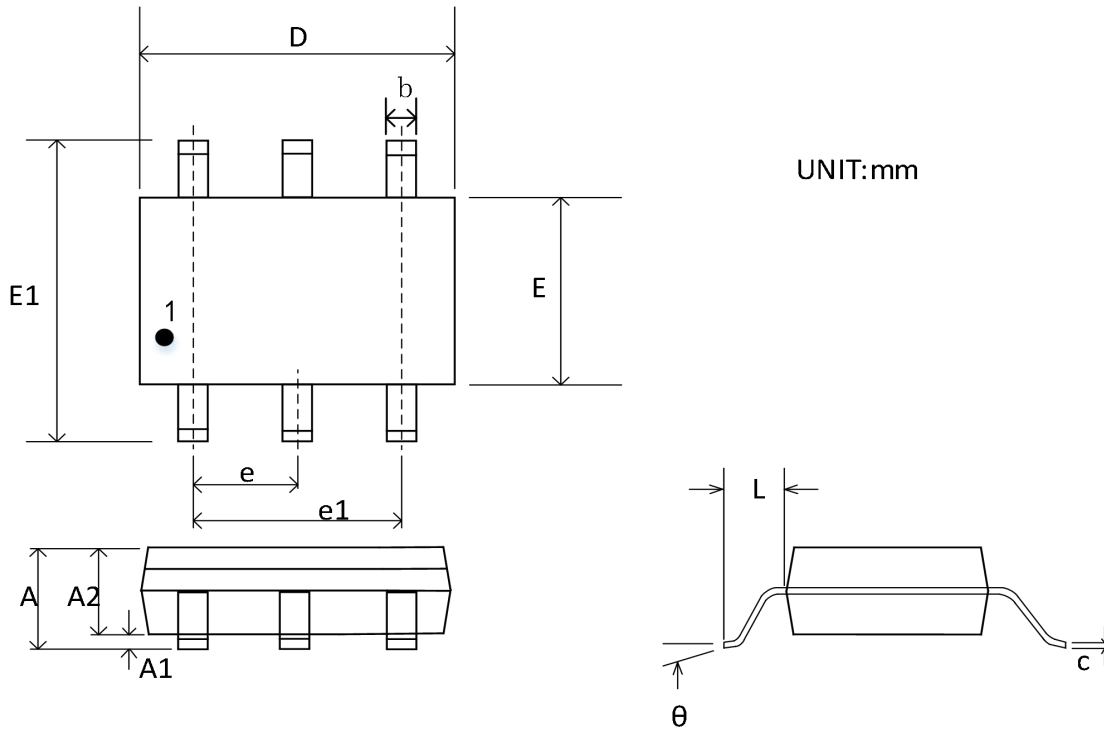
Package Outline Dimensions

SOT23-5



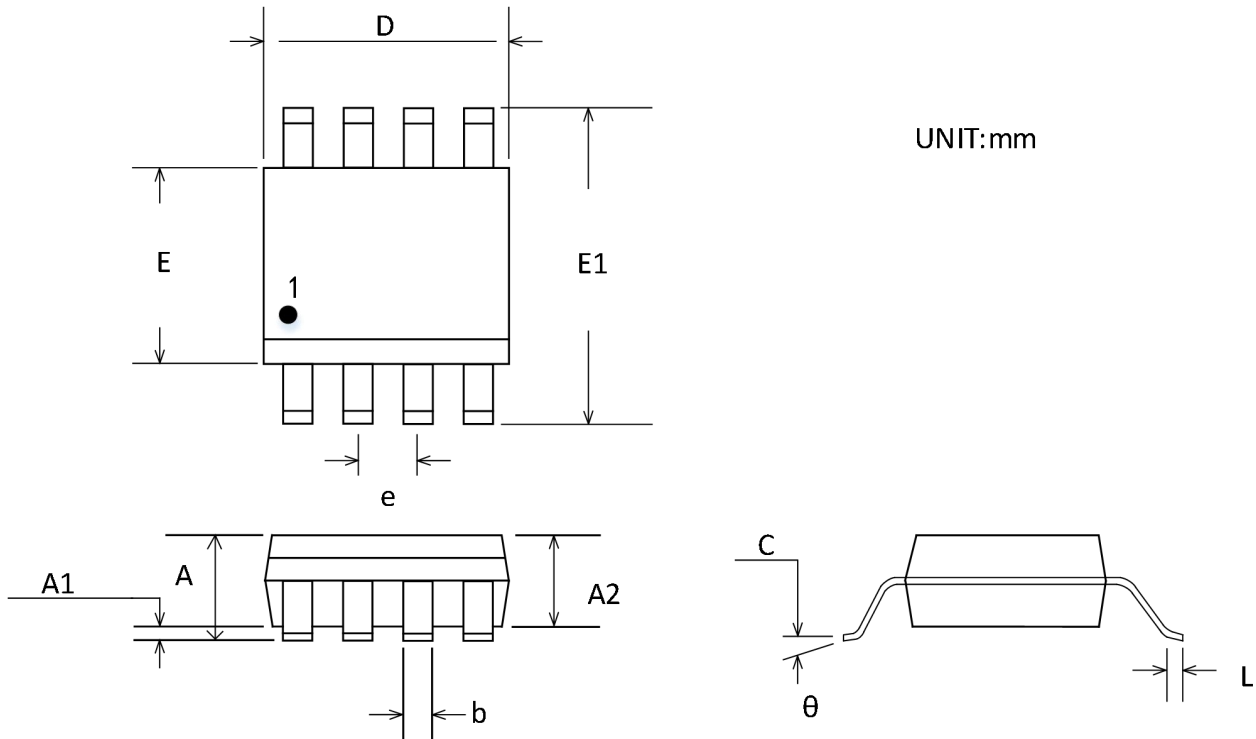
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT23-6



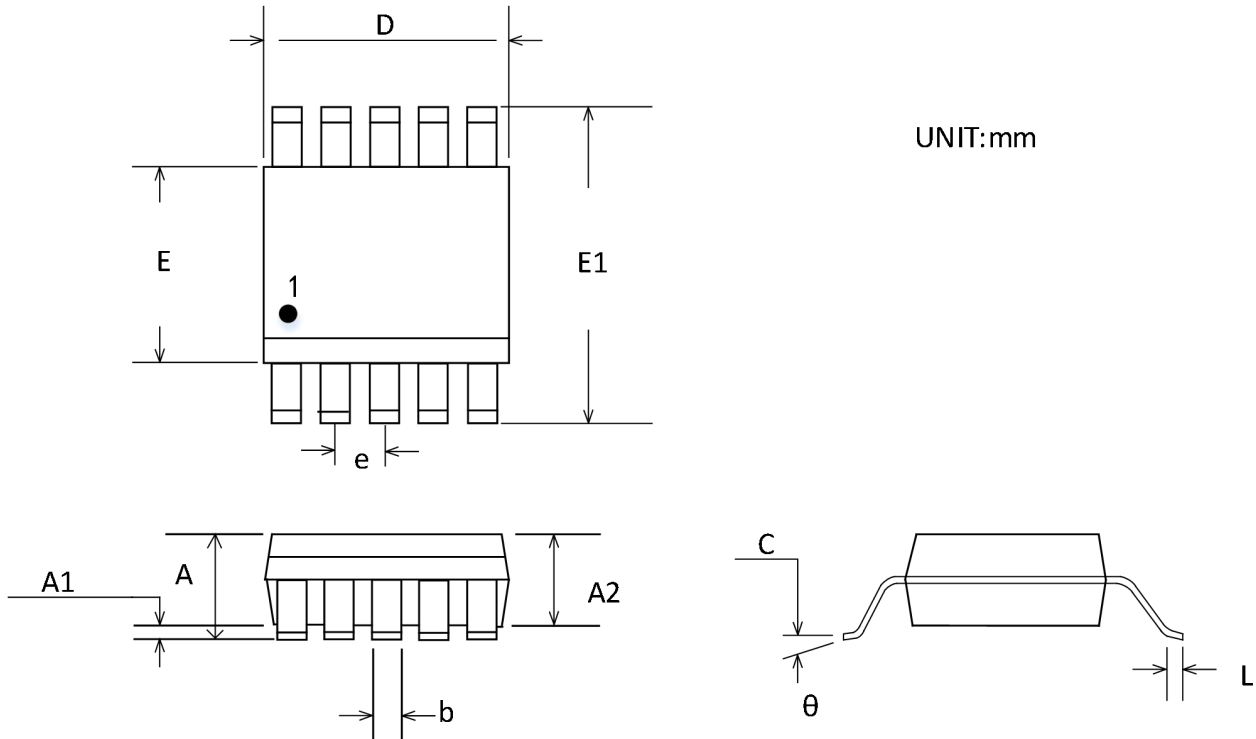
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC	0.075 BSC		
L	0.300		0.600	
θ	0°	8°	0°	8°

MSOP-8



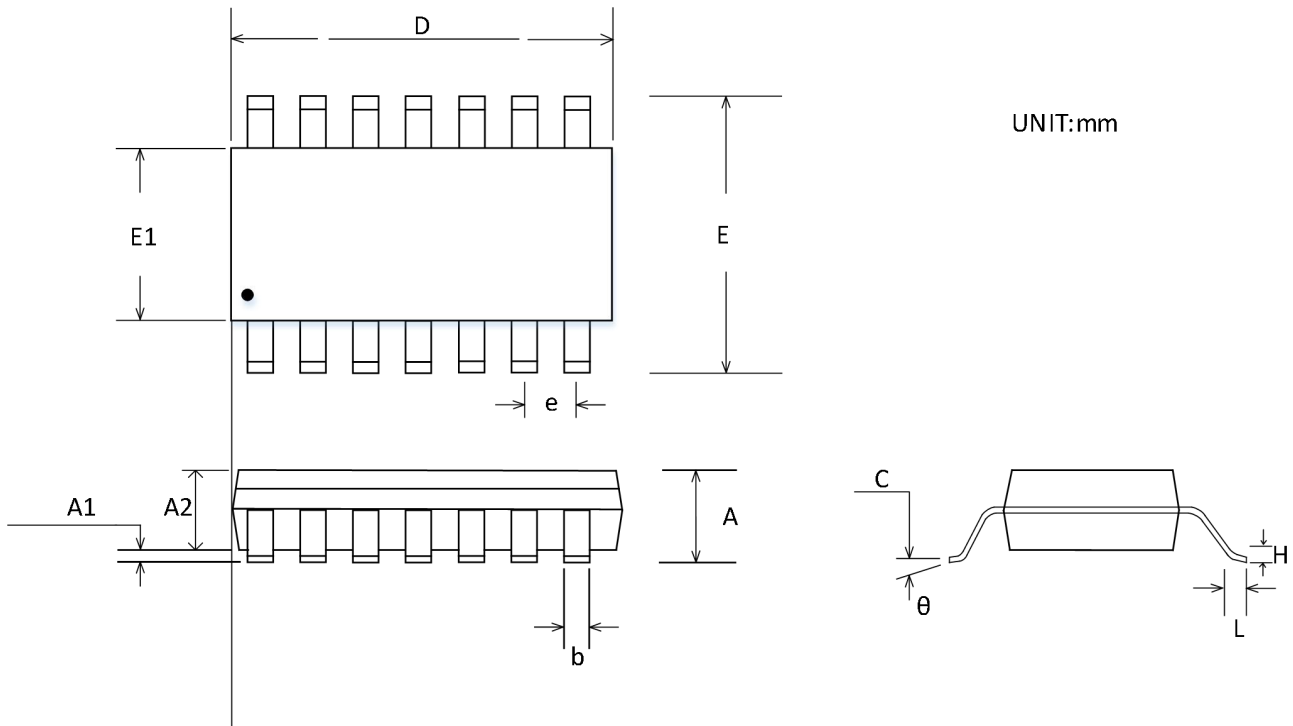
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC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

MSOP-10



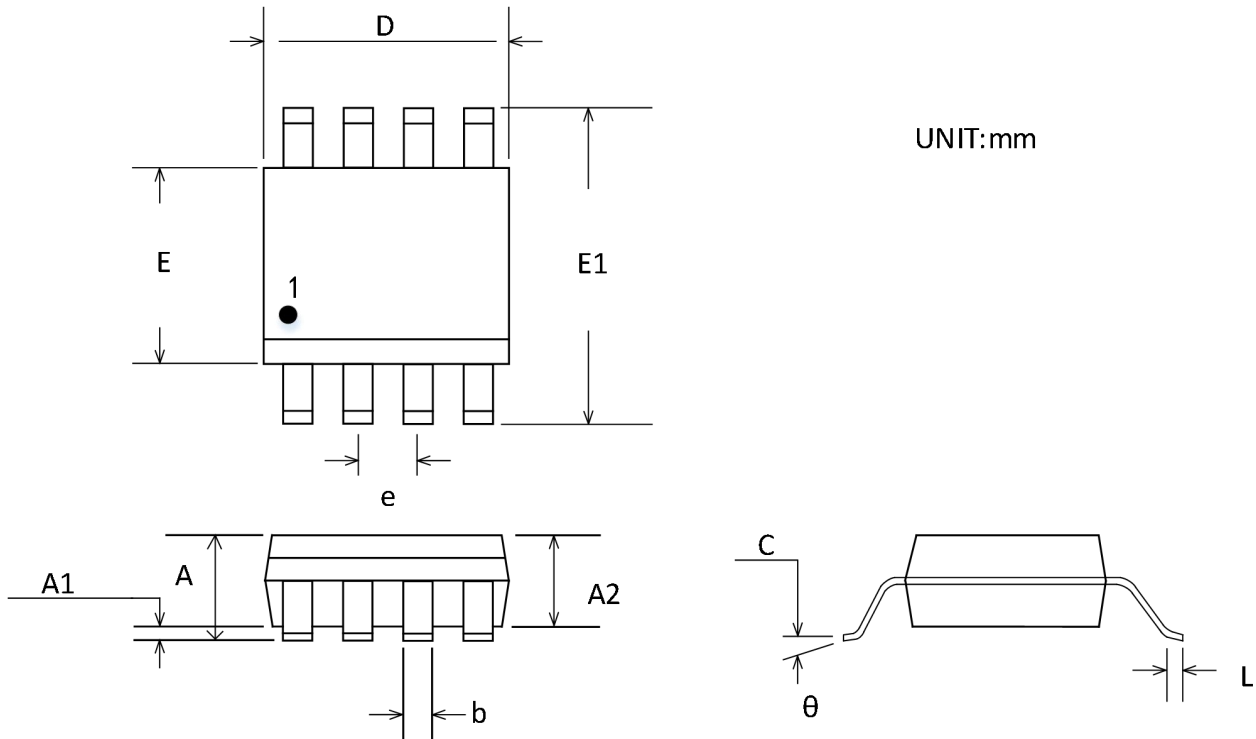
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.50 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

TSSOP-14



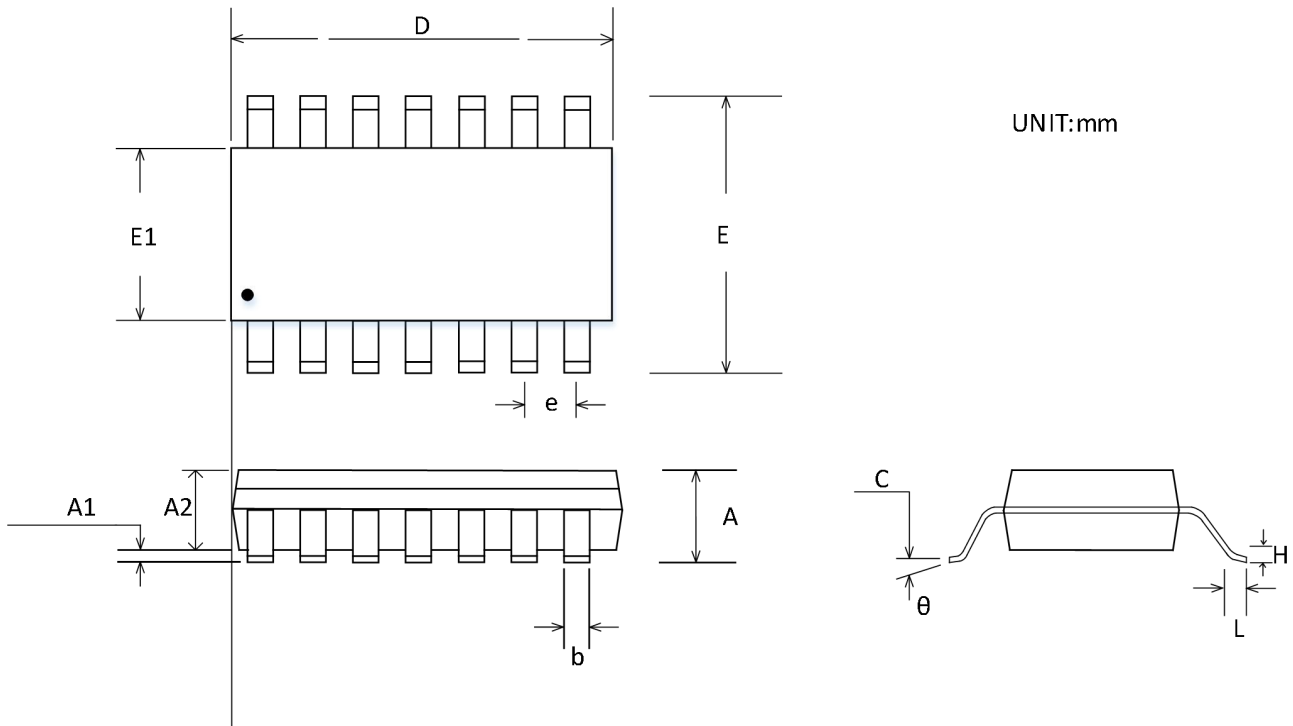
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500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

SOIC-8(SOP8)



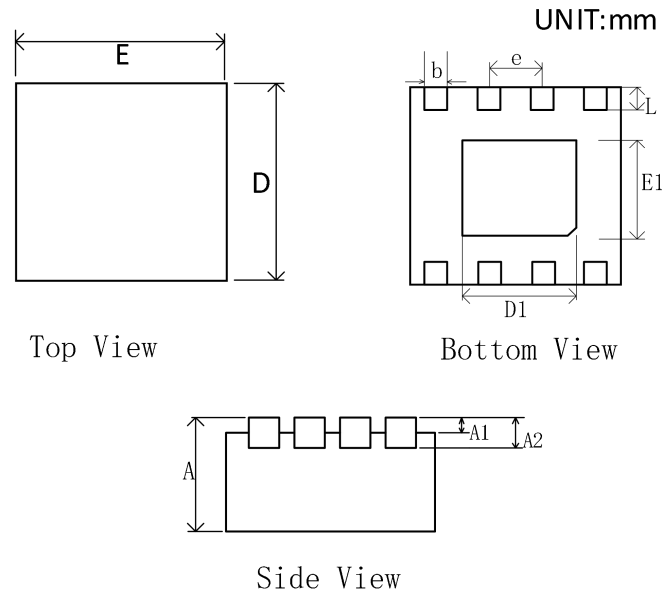
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC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

SOIC-14(SOP14)



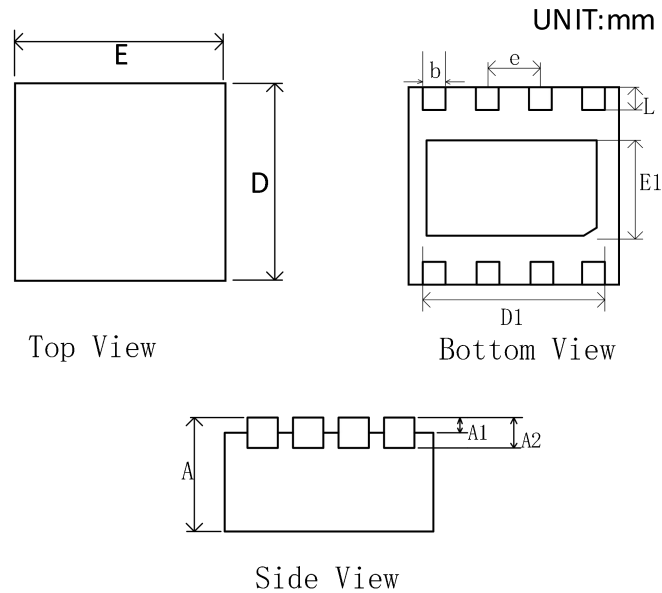
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC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

TDFN-2x2-8



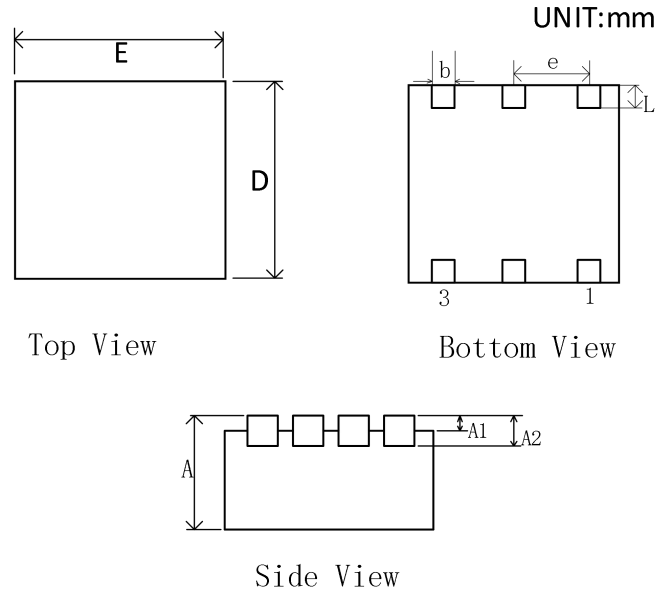
Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 TYP		0.008 TYP	
b	0.180	0.300	0.007	0.012
D	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.600	0.800	0.024	0.031
e	0.500 TYP		0.020 TYP	
L	0.250	0.450	0.010	0.018

TDFN-3×3-8



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 TYP		0.008 TYP	
b	0.250	0.350	0.010	0.014
D	2.900	3.100	0.114	0.122
D1	2.350	2.450	0.093	0.096
E	2.900	3.100	0.114	0.122
E1	1.650	1.750	0.065	0.069
e	0.650 TYP		0.026 TYP	
L	0.370	0.470	0.015	0.019

TDFN2x2-6



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 TYP		0.008 TYP	
b	0.250	0.350	0.010	0.012
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
e	0.650 TYP		0.026 TYP	
L	0.250	0.400	0.010	0.018

Package/Ordering Information

ORDERING NUMBER	TEMPRANGE	PACKAGE	PAKEAGE MARKING	TRANSPOT MEDIA,QUANTILY
CBMV721AS8	-40°C~125°C	SOIC-8(SOP8)	CBMV721A	Tape and Reel, 2500
CBMV721AS8-RL	-40°C~125°C	SOIC-8(SOP8)	CBMV721A	Tape and Reel, 3000
CBMV721AS8-REEL	-40°C~125°C	SOIC-8(SOP8)	CBMV721A	Tape and Reel, 4000
CBMV721AST5	-40°C~125°C	SOT23-5	721A	Tape and Reel, 3000
CBMV721BST5	-40°C~125°C	SOT23-5	721B	Tape and Reel, 3000
CBMV721AMS8	-40°C~125°C	MSOP-8	CBMV721	Tape and Reel, 3000
CBMV721ATDE6	-40°C~125°C	TDFN2x2-6	721D	Tape and Reel, 3000
CBMV721SAS8	-40°C~125°C	SOIC-8(SOP8)	CBMV721S	Tape and Reel, 2500
CBMV721SAS8-RL	-40°C~125°C	SOIC-8(SOP8)	CBMV721S	Tape and Reel, 3000
CBMV721SAS8-REEL	-40°C~125°C	SOIC-8(SOP8)	CBMV721S	Tape and Reel, 4000
CBMV721SAT6	-40°C~125°C	SOT23-6	721S	Tape and Reel, 3000
CBMV722AS8	-40°C~125°C	SOIC-8(SOP8)	CBMV722A	Tape and Reel, 2500
CBMV722AS8-RL	-40°C~125°C	SOIC-8(SOP8)	CBMV722A	Tape and Reel, 3000
CBMV722AS8-REEL	-40°C~125°C	SOIC-8(SOP8)	CBMV722A	Tape and Reel, 4000
CBMV722AMS8	-40°C~125°C	MSOP-8	CBMV722A	Tape and Reel, 3000
CBMV722ATDE8	-40°C~125°C	TDFN2x2-8	722TD	Tape and Reel, 3000
CBMV722ATDC8	-40°C~125°C	TDFN3x3-8	722DC	Tape and Reel, 3000
CBMV722SAS10	-40°C~125°C	SOIC-10(SOP-10)	CBMV722S	Tape and Reel, 2500
CBMV722SAS10-RL	-40°C~125°C	SOIC-10(SOP-10)	CBMV722S	Tape and Reel, 3000
CBMV722SAS10-REEL	-40°C~125°C	SOIC-10(SOP-10)	CBMV722S	Tape and Reel, 4000
CBMV724AS14	-40°C~125°C	SOIC-14(SOP14)	CBMV724A	Tape and Reel, 2500
CBMV724AS14-RL	-40°C~125°C	SOIC-14(SOP14)	CBMV724A	Tape and Reel, 3000
CBMV724AS14-REEL	-40°C~125°C	SOIC-14(SOP14)	CBMV724A	Tape and Reel, 4000
CBMV724ATS14	-40°C~125°C	TSSOP-14	CBMV724A	Tape and Reel, 2500
CBMV724ATS14-RL	-40°C~125°C	TSSOP-14	CBMV724A	Tape and Reel, 3000
CBMV724ATS4-REEL	-40°C~125°C	TSSOP-14	CBMV724A	Tape and Reel, 4000