FEATURES

- HIGH GAIN BANDWIDTH:1.1MHz
- RAIL-TO-RAIL INPUT AND OUTPUT
  0.8mV Typical V_{OS}
- INPUT VOLTAGE RANGE: -0.1V to +5.6V with Vs = 5.5V
- SUPPLY RANGE: +2.5V to +5.5V
- SHUTDOWN: CBMV321S/CBMV358S
- SPECIFIED UP TO +125°C
- MicroSIZE PACKAGES: SOT23-5, SOT23-6

APPLICATIONS

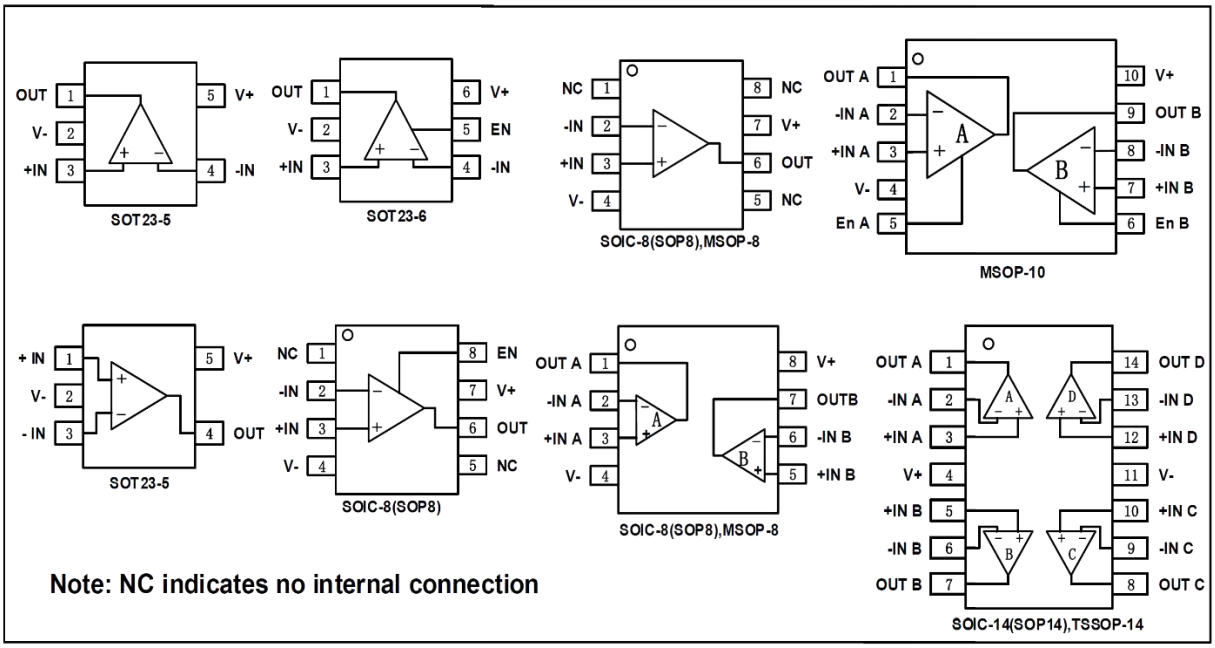
- SENSORS
- PHOTODIODE AMPLIFICATION
- ACTIVE FILTERS
- TEST EQUIPMENT
- DRIVING A/D CONVERTERS

DESCRIPTION

The CBMV321, CBMV358, CBMV324, CBMV321S, CBMV358S 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 (1.1MHz) and slew rate of 0.5V/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 CBMV321S, CBMV358S 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 CBMV321, CBMV358, CBMV324, CBMV321S, CBMV358S 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.

PIN CONFIGURATIONS



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

SOT23-5, SOT23-6.....200°C/W

MSOP-10, 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 SENSITIVITY 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℃, Vs=5V, R_L = 10kΩ connected to $V_S/2$, and V_{OUT} = $V_S/2$, unless otherwise noted.)

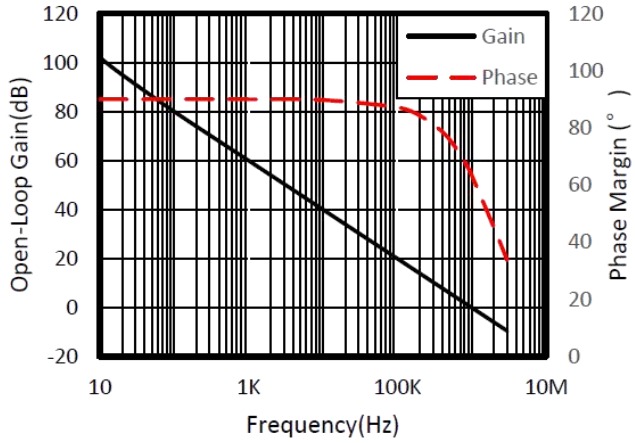
PARAMETER		CONDITIONS	T_J	CBMV321S,CBMV358S CBMV321,CBMV358, CBMV324			UNIT
				MIN	TYP	MAX	
POWER SUPPLY							
Vs	Operating Voltage Range		25℃	2.5		5.5	V
IQ	Quiescent Current/Amplifier		25℃		60	80	uA
PSRR	Power-Supply Rejection Ratio	Vs=2.5V to 5.5V, Vcm=(V-)+0.5V	25℃	62	85		dB
			-40℃ to 125℃	58			
INPUT							
V_{OS}	Input Offset Voltage		25℃		0.8	4.5	mV
V_{OS} TC	Input Offset Voltage Average Drift	-40℃ to 125℃			2.9		uV/℃
IB	Input Bias Current		25℃		1	10	pA
Ios	Input Offset Current		25℃		1	10	pA
Vcm	Common-Mode Voltage	Vs= 5.5V	25℃	-0.1		5.6	V

	Range						
CMRR	Common-Mode Rejection Ratio	Vs= 5.5V, Vcm=-0.1V to 4V	25℃	65	80		dB
			-40℃ to 125℃	62			
		Vs= 5.5V, Vcm=-0.1V to 5.6V	25℃	57	75		
			-40℃ to 125℃	55			
OUTPUT							
AOL	Open-Loop Voltage Gain	RL=2KΩ, Vo=0.15V to 4.85V	25℃	75	95		dB
			-40℃ to 125℃	72			
		RL=10KΩ,Vo=0.05V to 4.95V	25℃	85	100		
			-40℃ to 125℃	82			
	Output Swing From Rail	R_L=2KΩ	25℃		26		mV
		R_L=10KΩ			8		
Iout	Output Short-Circuit Current		25℃		54		mA
FREQUENCY RESPONSE							
SR	Sles Rate		25℃		0.5		V/us
GBP	Gain-Bandwidth Product		25℃		1.1		MHz
PM	Phase Margin		25℃		64		°
ts	Setting Time,0.1%				1.3		us
	Overload Recovery Time	V_{IN}·Gain≥VS			2.3		us
NOISE							
e_n	Input Voltage Noise Density	f=1 KHz	25℃		23		nV/√Hz
		f=10KHz	25℃		20		nV/√Hz
ENABLE/SHUTDOWN(CBMV321S,CBMV358S)							
$I_{Q(OFF)}$	Supply Current in Shutdown		25℃		<1		uA
t_{OFF}			25℃		3		us
t_{ON}			25℃		20		us
V_L	Shut Down		25℃	V-		(V-)+0.8	V
V_H	Amplifier Is Active		25℃	(V-)+2		V+	V

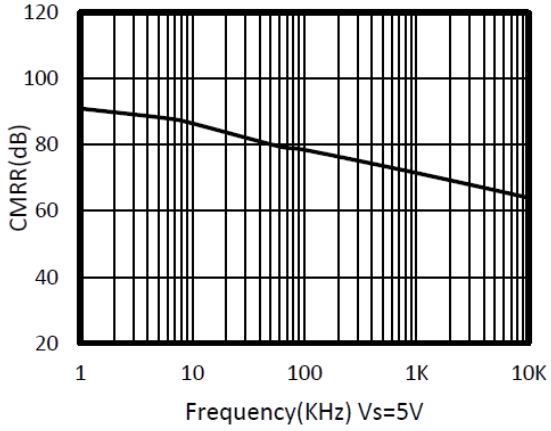
TYPICAL CHARACTERISTICS

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

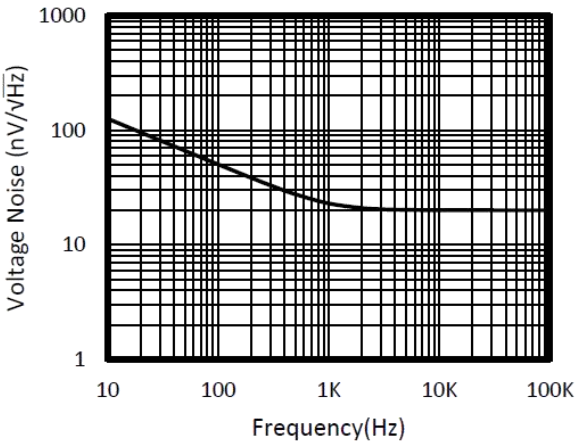
OPEN−LOOP GAIN AND PHASE vs FREQUENCY



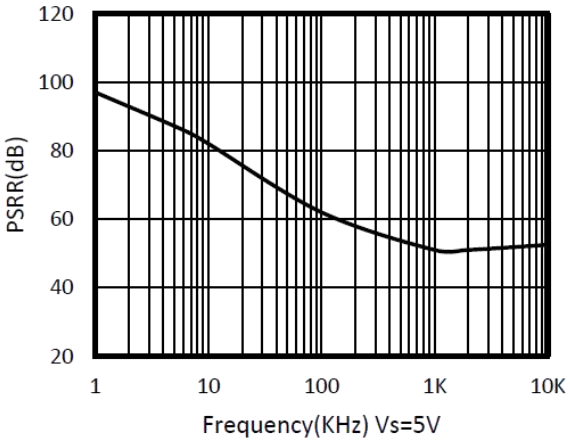
COMMON−MODE REJECTION RATIO vs FREQUENCY



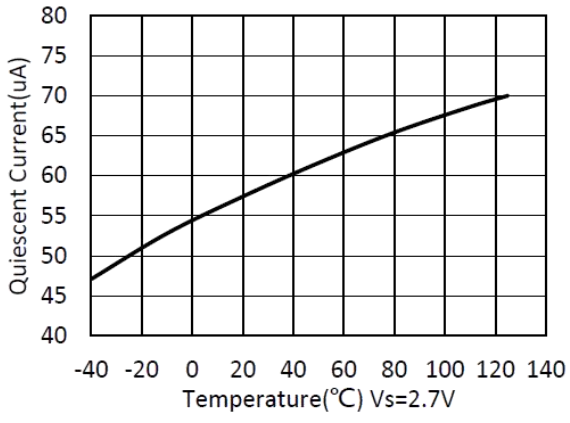
INPUT VOLTAGE NOISE SPECTRAL DENSITY vs FREQUENCY



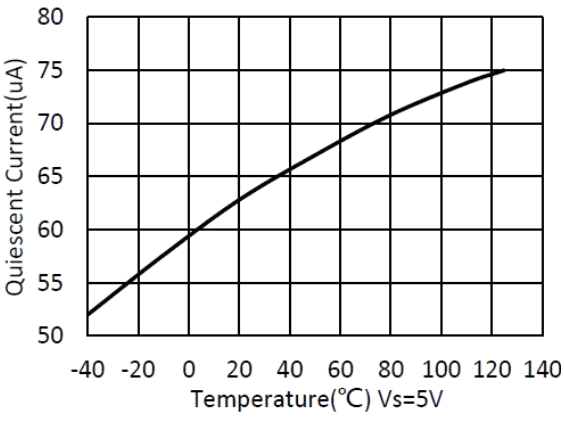
POWER−SUPPLY REJECTION RATIO vs FREQUENCY



QUIESCENT CURRENT vs TEMPERATURE



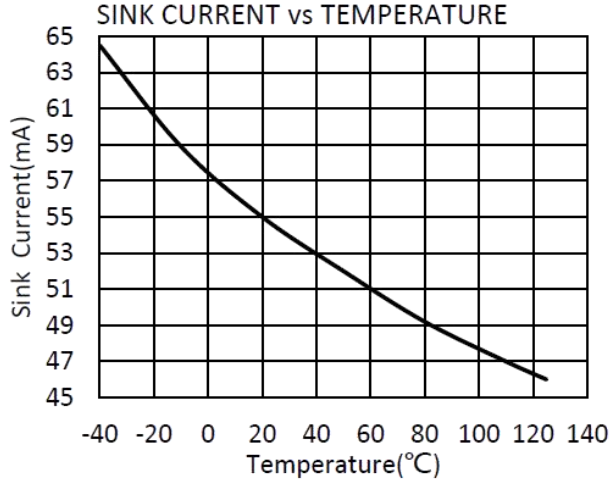
QUIESCENT CURRENT vs TEMPERATURE



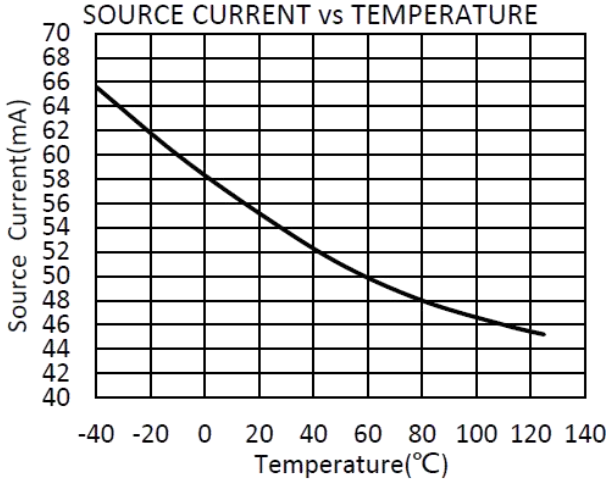
TYPICAL CHARACTERISTICS

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

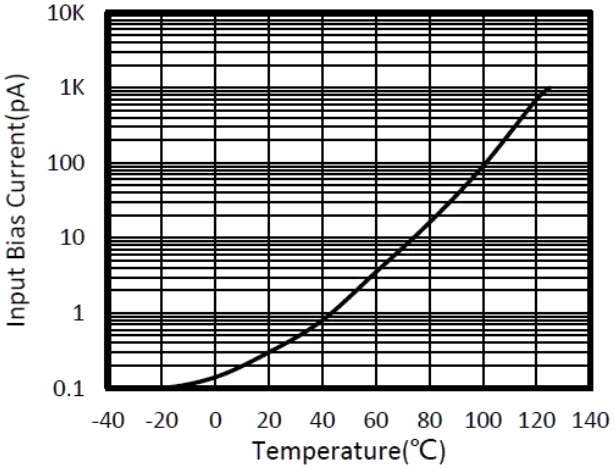
SINK CURRENT vs TEMPERATURE



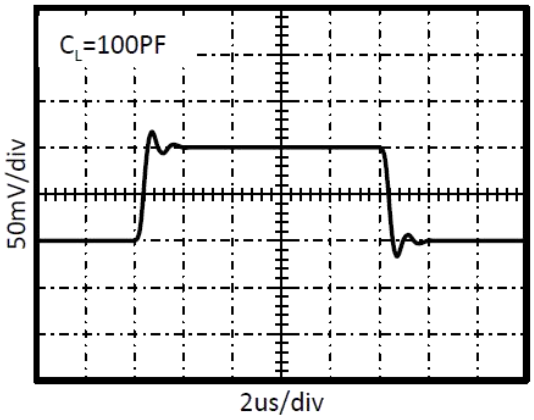
SOURCE CURRENT vs TEMPERATURE



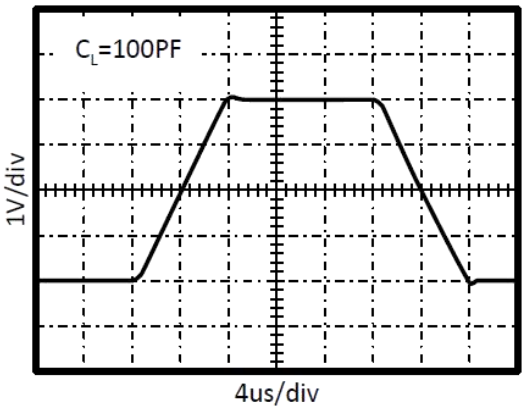
INPUT BIAS CURRENT vs TEMPERATURE



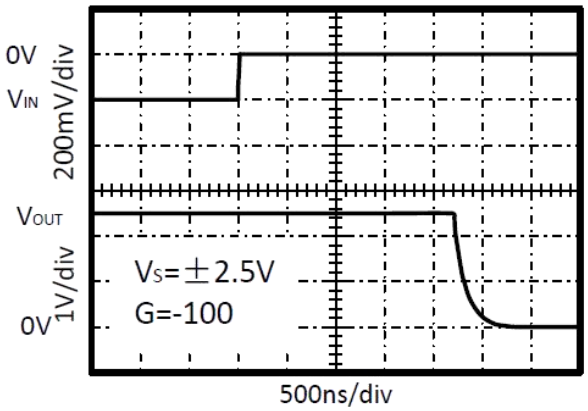
SMALL-SIGNAL STEP RESPONSE



LARGE-SIGNAL STEP RESPONSE



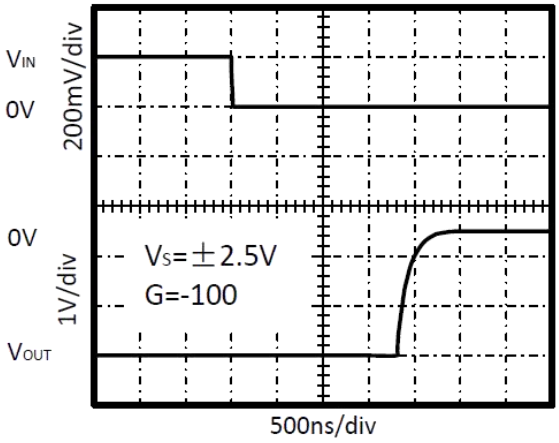
POSITIVE OVERVOLTAGE RECOVERY



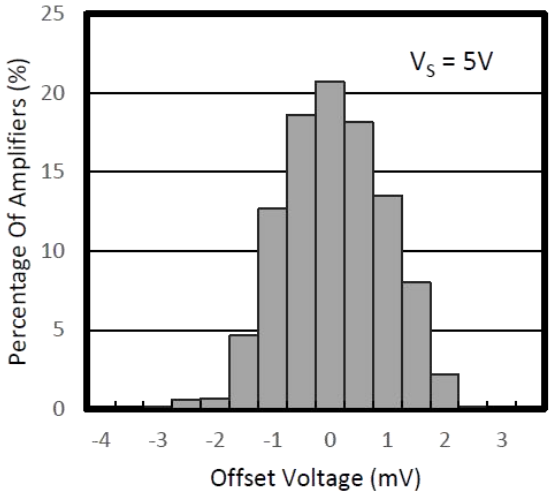
TYPICAL CHARACTERISTICS

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

Negative Overvoltage Recovery



Offset Voltage Production Distribution



APPLICATION NOTES

The CBMV321, CBMV358, CBMV324, CBMV321S, CBMV358S are high precision, rail-to-rail operational amplifiers that can be run from a single-supply voltage 2.5V to 5.5V (±1.25V to ±2.75V). 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 0.1uF capacitor place closely across the supply pins.

CBMV321S/CBMV358S ENABLE FUNCTION

The CBMV321S/CBMV358S includes a shutdown mode. Under logic control, the amplifiers can be switched from normal mode to a standby current of 1uA. 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 GUIDELINS

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,

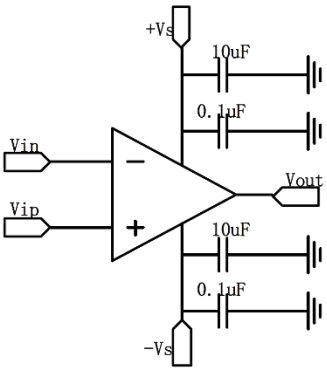


Figure1. Amplifier with Bypass Capacitors

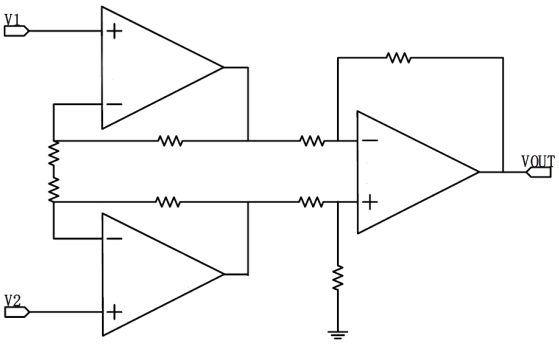
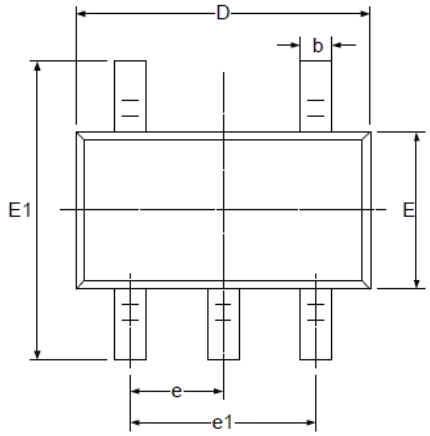
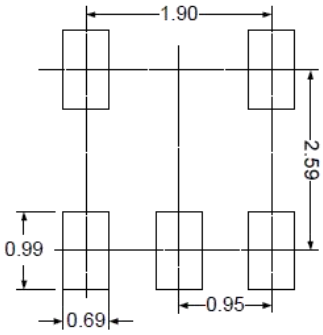


Figure2. Amplifier instrumentation amplifier

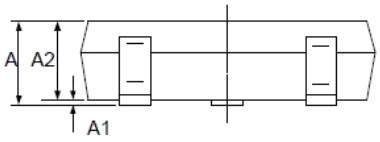
PACKAGE OUTLINE DIMENSIONS

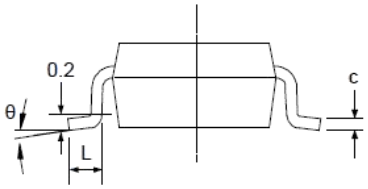
SOT23-5





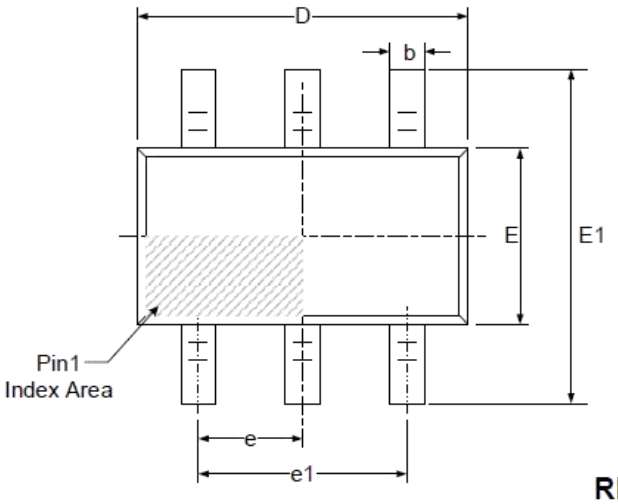
RECOMMENDED LAND PATTERN (Unit: mm)

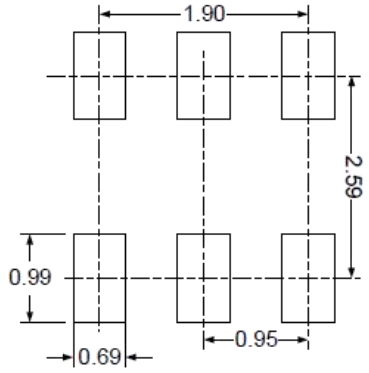




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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





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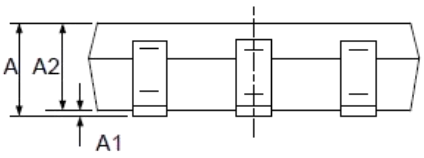
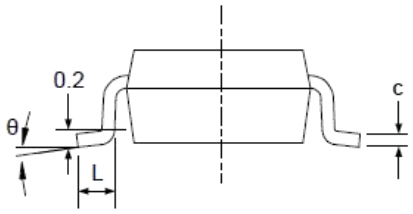
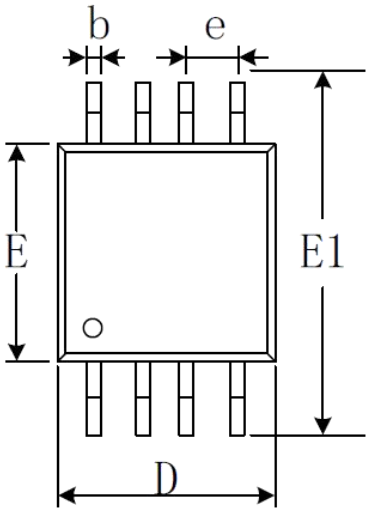
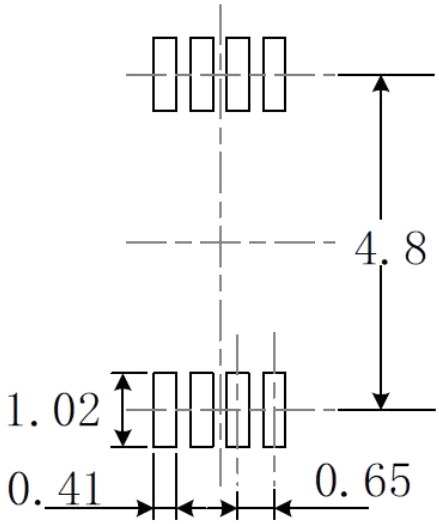




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

MSOP-8





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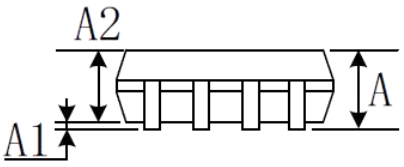
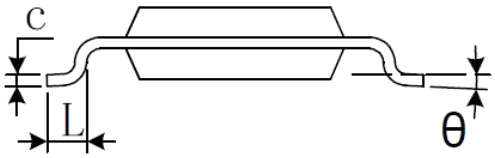
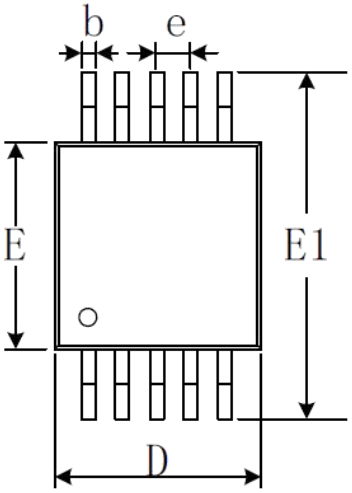
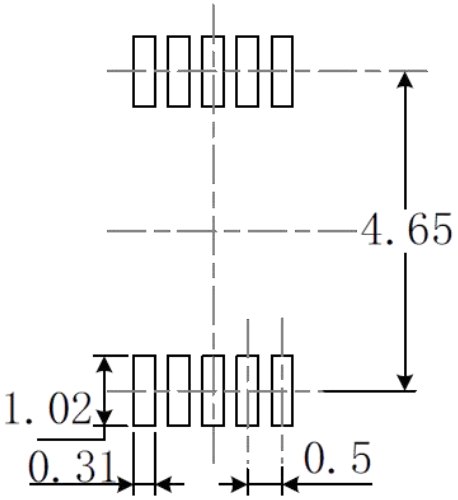




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

MSOP-10





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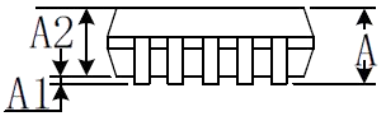
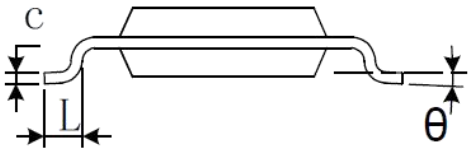
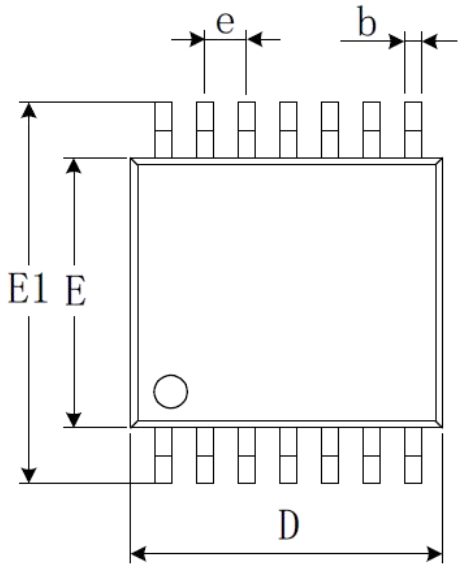
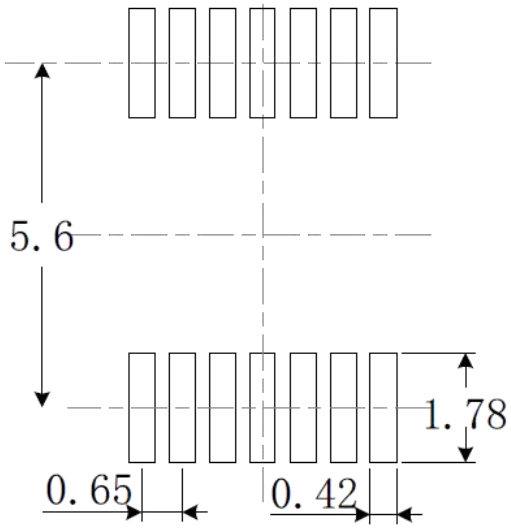




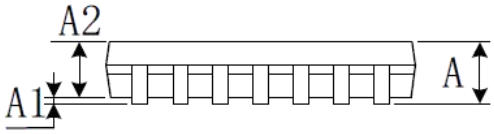
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.50 BSC		0.020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

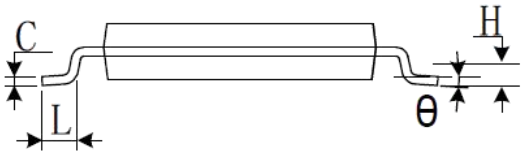
TSSOP-14





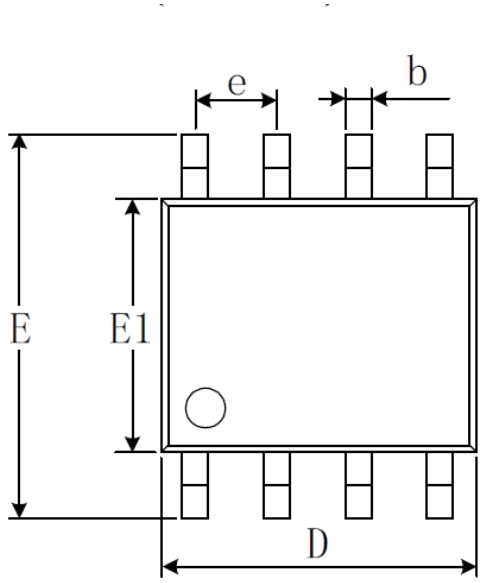
RECOMMENDED LAND PATTERN (Unit: mm)

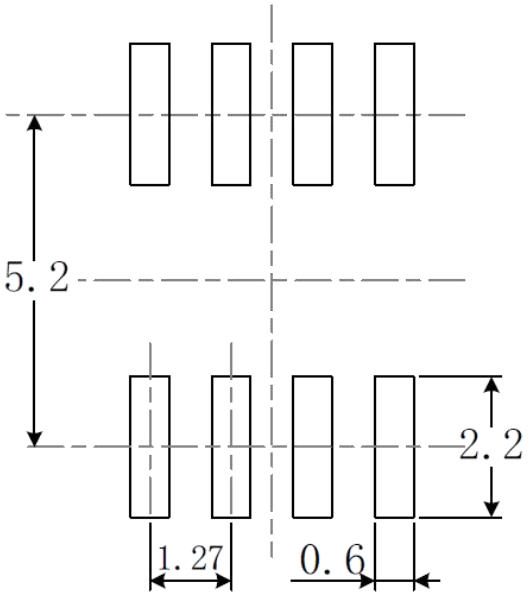




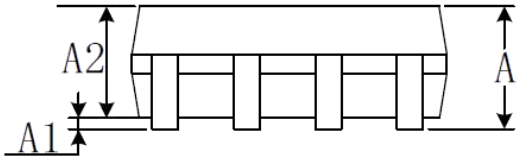
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500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

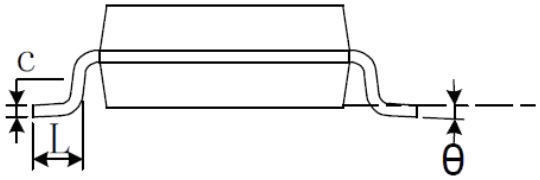
SOIC-8(SOP8)





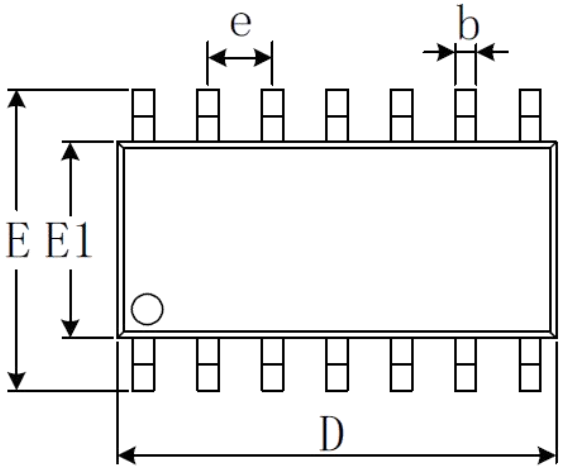
RECOMMENDED LAND PATTERN (Unit: mm)

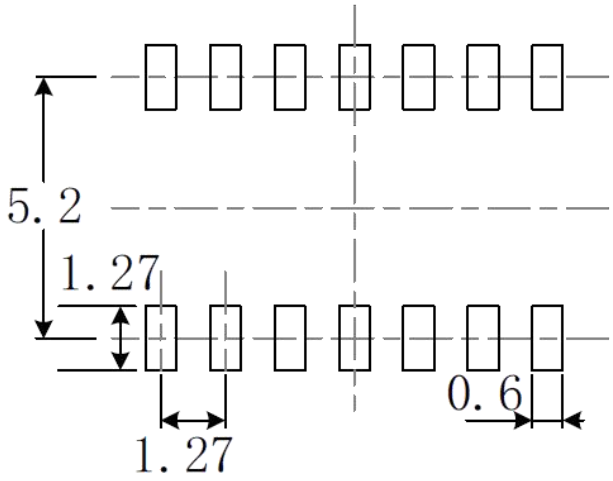




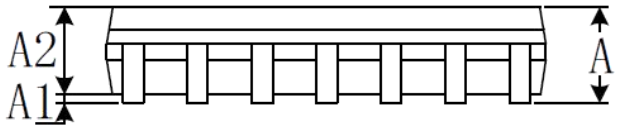
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050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

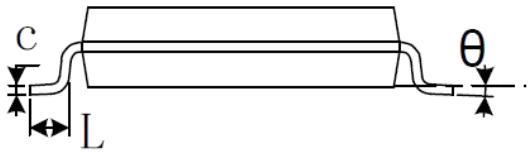
SOIC-14(SOP14)





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In 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°

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPRANGE	PACKAGE	PAKEAGE MARKING	TRANSPOT MEDIA,QUANTILY
CBMV321	CBMV321AS8	-40℃~125℃	SOIC-8(SOP8)	CBMV321	Tape and Reel,2500
	CBMV321AST5	-40℃~125℃	SOT23-5	321	Tape and Reel,3000
	CBMV321BST5	-40℃~125℃	SOT23-5	321B	Tape and Reel,3000
	CBMV321AMS8	-40℃~125℃	MSOP-8	CBMV321	Tape and Reel,3000
CBMV321S	CBMV321SA8	-40℃~125℃	SOIC-8(SOP8)	CBMV321S	Tape and Reel,2500
	CBMV321SAT6	-40℃~125℃	SOT23-6	321S	Tape and Reel,3000
CBMV358	CBMV358AS8	-40℃~125℃	SOIC-8(SOP8)	CBMV358	Tape and Reel,2500
	CBMV358AMS8	-40℃~125℃	MSOP-8	CBMV358	Tape and Reel,3000
CBMV358S	CBMV358AMS10	-40℃~125℃	MSOP-10	CBMV358S	Tape and Reel,3000
CBMV324	CBMV324AS14	-40℃~125℃	SOIC-14(SOP14)	CBMV324	Tape and Reel,2500
	CBMV324ATS14	-40℃~125℃	TSSOP-14	CBMV324	Tape and Reel,3000

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