芯伯乐®
XINBOLE

Product Specification

XBLW AD8551.8552.8554

Zero-Drift,Rail-to-Rail Input/Output Operational Amplifiers

WEB | www.xinboleic.com

RoHS

Description

The AD8551(single), AD8552(dual) and AD8554(quad) are high-precision, low- quiescent current amplifier which can offer high input impedance and rail-to-rail input and output. The amplifier uses auto-zeroing techniques to provide low offset voltage(2μV type) and near zero-drift over time and temperature.

The AD8551 is a vailable in SOT23-5, SC70-5 and SOP-8.The AD8552 is a vailable in SOP-8 and MSOP-8.The AD8554 is a vailable in SOP-14 and TSSOP-14.

Feature:

- Rail-to-Rail Input and Output
- Supply Range: 1.8V to 5.5V
- Low Noise: 48nV/√Hz
  0.1Hzto10Hz Noise: 0.8μVPP
- Excellent DC Precision:
  Open-loop gain: 135dB
  PSRR: 110dB
  CMRR: 110dB
- Gain bandwidth: 0.4MHz
- Quiescent current: 18μA(Typ.)
- Low Offset Voltage: 2μV(Typ.)
- Zero-Dirft:: 0.03μv/℃

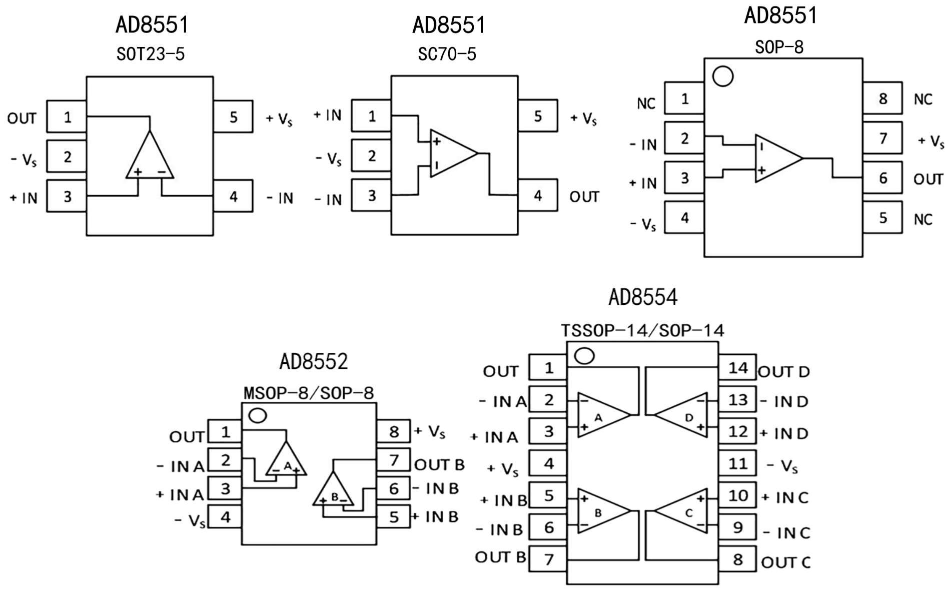
Applications

- Strain Gauges
- Bridge Amplifier
- Electronic Scales
- Transducer Applications
- Medical Instrumentation
- Handheld Test Equipment
- Temperature Measurement
- Resistance Temperature Detectors

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW AD8551T	SOT23-5	8551T	Tape	3000Pcs/Reel
XBLW AD8551C	SC70-5	8551C	Tape	3000Pcs/Reel
XBLW AD8551ARZ	SOP-8	8551A	Tape	2500Pcs/Reel
XBLW AD8552ARZ	SOP-8	AD8552	Tape	2500Pcs/Reel
XBLW AD8552ARZM	MSOP-8	8552M	Tape	3000Pcs/Reel
XBLW AD8552ARZT	TSSOP-8	8552T	Tape	3000Pcs/Reel
XBLW AD8554ARZ	SOP-14	AD8554	Tape	2500Pcs/Reel
XBLW AD8554ARZT	TSSOP-14	8554T	Tape	3000Pcs/Reel

Pin Configurations



Pin Description

Symbol	Description
-INA,-INB -INC,-IND	Inverting Input of the Amplifier.The Voltage range can go from(V_{S-})to(V_{S+}).
+INA,+INB +INC,+IND	Non-Inverting Input of Amplifier. This pin has the same voltage range as –IN.
$+V_S$	Positive Power Supply. The voltage is from 1.8V to 5.5V（±0.9V to ±2.75V).
$-V_S$	Negative Power Supply. It is normally tied to ground.
OUTA,OUTB OUTC,OUTD	Amplifier Output.
N/C	No Connection.

Absolute Maximum Ratings（TA=25℃)

Parameter	Description	Value	Units
Supply Voltage		±3,+6 (Single)	V
Voltage	Input Terminal	V_{S-}–0.3 to V_{S+}0.3	V
Differential Voltage		±5	V
Temperature	Operating(2),T_A	-55 to +150	°C
	Junction,T_J	150	°C
	Storage,T_{STG}	–55 to +150	°C
HBM	Electrostatic Discharge Voltage	8	kV

Note:
1.1.Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2.Provided device does not exceed maximum junction temperature (TJ) at any time.

Electrical Characteristics

VS=+5.0V ,TA=+25°C ,VCM=VS /2 ,VO=VS/2 ,RL=10kΩ connected to VS/2, unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
INPUT CHARACTERISTICS						
V_{OS}	Input offset voltage			2	15	μV
V_{OS} TC	Offset voltage drif	T_A=-40℃to+125℃		0.03		μV/°C
I_B	Input bias current	$V_{CM}=V_S/2$		±100		PA
I_{OS}	Input offset current			±100		PA
V_{CM}	Common-mode voltage range	T_A=-40℃to+125℃	V_{S-}		V_{S+}	V
CMRR	Common-mode rejection ratio	$V_{S-}<V_{CM}<V_{S+}$	90	110		dB
		T_A=-40℃to+125℃	85			dB
A_{VOL}	Open-loop voltage gain	$V_{S-}+0.3V<V_O<V_{S+}-0.3V$	105	135		dB
		T_A=-40℃to+125℃	100			dB
OUTPUT CHARACTERISTICS						
V_{OH}	High output voltage swing	R_L=10KΩ	(V_{S+})-12	(V_{S+})-4		mV
		T_A=-40℃to+125℃	(V_{S+})-18			mV
V_{OL}	Low output voltage swing	R_L=10KΩ		(V_{S-})+4	(V_{S-})+12	mV
		T_A=-40℃to+125℃			(V_{S-})+18	mV
I_{SC}	Short-circuit current	Source current	55	65		mA
		T_A=-40℃to+125℃	50			mA
		Sink current	48	55		mA
		T_A=-40℃to+125℃	45			mA
POWER SUPPLY						
PSRR	Power supply rejection ratio	V_S=1.8Vto5.5V	90	110		dB
		T_A=-40℃to+125℃	80			dB
I_Q	Quiescent current (per amplifier)	T_A=-40℃to+125℃		20	28	μA
					35	μA
NOISE PERFORMANCE						
e_n	Input voltage noise density	f=0.1Hzto10Hz		800		nVpp
		f=1KHz		48		nV/√Hz
DYNAMIC PERFORMANCE						
GBW	Gain bandwidth product			0.4		MHz
SR	Slew rate	G=+1		0.1		V/μs
t_{OR}	Overload recovery time	G=-10		20		μs

Electrical Characteristics

V_S=+2.7V,T_A=+25°C,V_O=V_S/2,R_L=10kΩconnectedtoV_S/2,unlessotherwisenoted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
INPUT CHARACTERISTICS						
V_{OS}	Input offset voltage			4	20	μV
V_{OS} TC	Offset voltage drift	T_A=-40℃to+125℃		0.03		μV/°C
I_B	Input bias curren	V_{CM}=V_S/2		±100		PA
I_{OS}	Input offset current			±100		PA
V_{CM}	Common-mode rejection ratio	T_A=-40℃to+125℃	V_{S-}		V_{S+}	V
CMRR	Common-mode rejection ratio	V_{S-}<V_{CM}<V_{S+}	90	110		dB
		T_A=-40℃to+125℃	80	100		
A_{VOL}	Open-loop voltage gain	V_{S-}+0.3V<V_O<V_{S+}-0.3V	105	135		
		T_A=-40℃to+125℃	95			
OUTPUT CHARACTERISTICS						
V_{OH}	High output voltage swing	R_L=10KΩ	(V_{S+})-12	(V_{S+})-3		mV
		T_A=-40℃to+125℃	(V_{S+})-18			
V_{OL}	Low output voltage swing	R_L=10KΩ		(V_{S-})+3	(V_{S-})+12	mV
		T_A=-40℃to+125℃			(V_{S-})+18	
I_{SC}	Short-circuit current	Source current	17	24		mA
		T_A=-40℃to+125℃	14			mA
		Sink current	15	20		mA
		T_A=-40℃to+125℃	12			mA
POWE RSUPPLY						
PSRR	Power supply rejection ratio	V_S=1.8V to 5.5V	90	110		dB
		T_A=-40℃to+125℃	80			
I_Q	Quiescent current (per amplifier)	T_A=-40℃to+125℃		18	25	μA
					35	
NOISE PERFORMANCE						
e_n	Input voltage noise density	f=0.1Hzto10Hz		800		nVpp
		f=1KHz		48		nV/√Hz
DYNAMIC PERFORMANCE						
GBW	Gain bandwidth product	f=1kHz		0.4		MHz
SR	Slew rate	G=+1		0.1		V/μs
t_{OR}	Overload recovery time	G=-10		20		μs

Typical Performance Characteristics

V_S=+5V, T_A=+25°C, V_{CM}=V_S/2, R_L=10kΩ connected to V/2, unless otherwise noted.

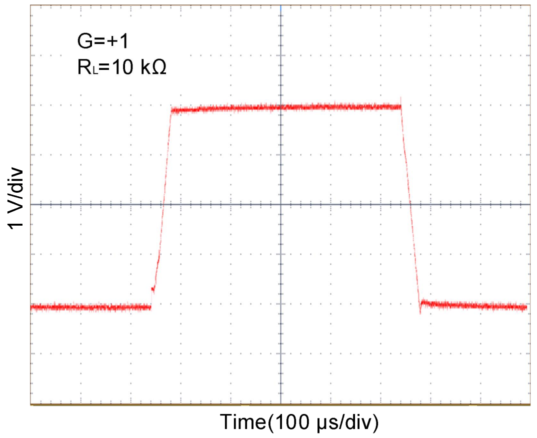


Figure 1 LARGE-SIGNAL STEP RESPONSE at +5V

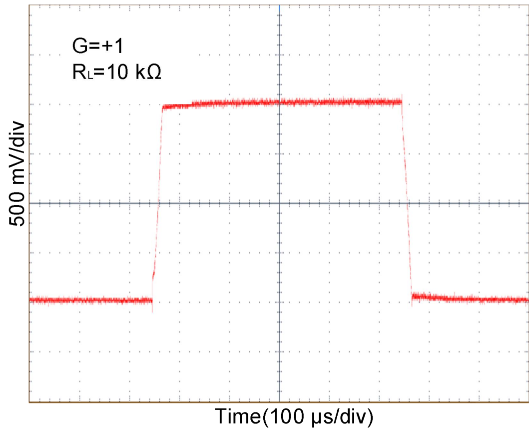


Figure 2 LARGE-SIGNAL STEP RESPONSE at +2.7V

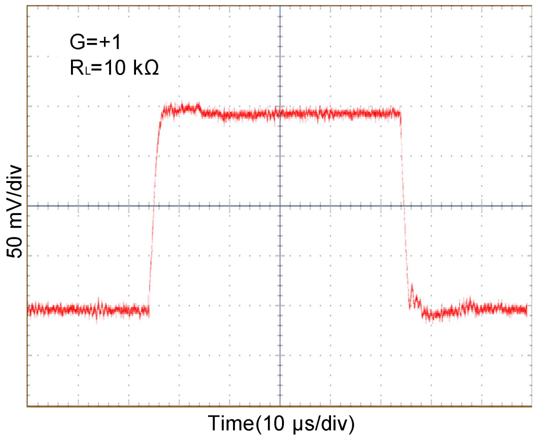


Figure 3 SMALL-SIGNAL STEP RESPONSE at +5V

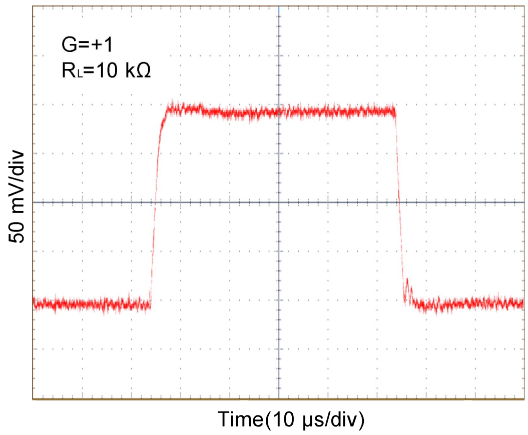


Figure 4 SMALL-SIGNAL STEP RESPONSE at +2.7V

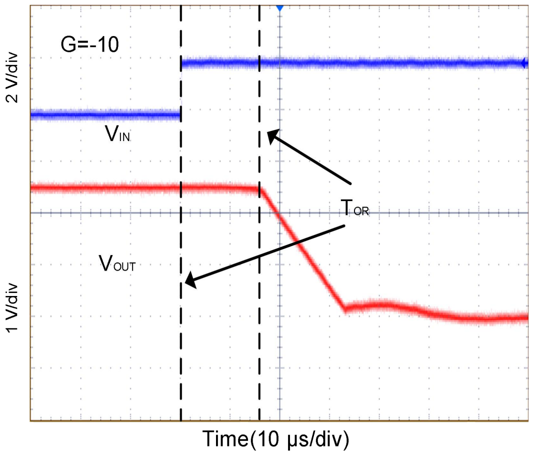


Figure 5 POSITIVE OVERLOAD RECOVERY

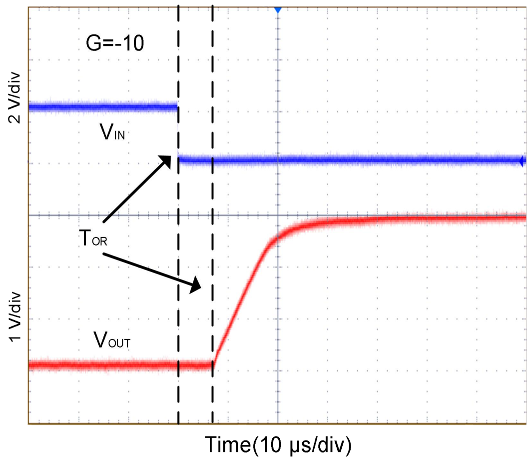


Figure 6 NEGATIVE OVERLOAD RECOVERY

Typical Performance Characteristics

V_S=+5V T_A=+25°C V_{CM}=V_S/2 R_L=10kΩ connected to V/2 unless otherwise noted

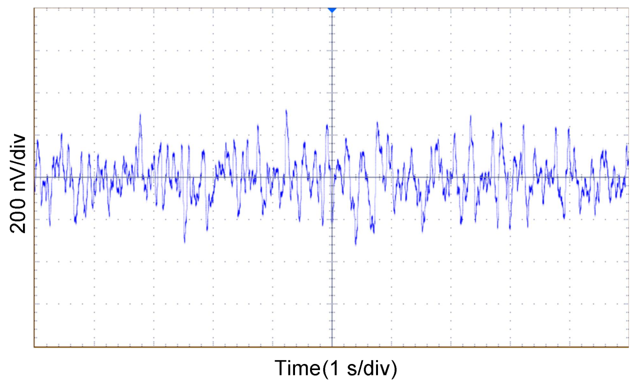


Figure 7 0.1Hz to 10Hz noise

Application Notes

1. Operation Characteristics

The AD855X is specified for operation from 1.8V to 5.5 V (±0.9V to ±2.75 V). Many specifications apply from –40℃ to +125℃. Parameters that can exhibit significant variance with regard to operating voltage or temperature are presented in *Typical Characteristics.*

2. Capacitive Load and Stability

The unity-gain follower (buffer) is the most sensitive configuration to capacitive loading. Direct capacitive loading reduces the phase margin of amplifiers and this results in ringing or even oscillation. Applications that require greater capacitive drive capability should use an isolation resistor between the output and the capacitive load like the circuit in Figure 8. The isolation resistor R_{ISO} and the load capacitor C_L form a zero to increase stability. The bigger the R_{ISO} resistor value, the more stable Vout will be. Note that this method results in a loss of gain accuracy because R_{ISO} forms a voltage divider with the R_L.

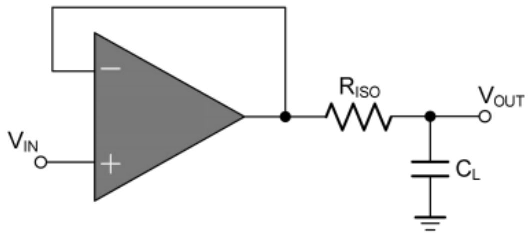


Figure 8 . Indirectly Driving Heavy Capacitive Load

An improvement circuit is shown in Figure 9 . It provides DC accuracy as well as AC stability. The R_F provides the DC accuracy by connecting the inverting signal with the output.

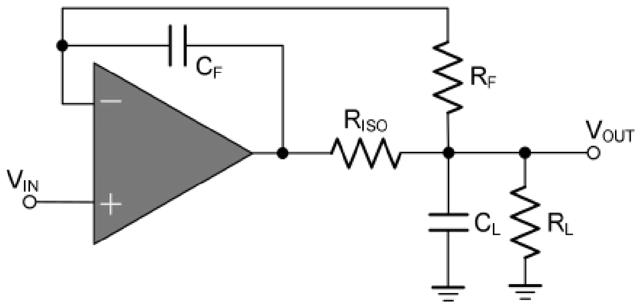


Figure 9.Indirectly Driving Capacitive Load with DC Accuracy

3. Input Bias Current Clock Feedthrough

The AD855X use switching on the inputs to correct for the intrinsic offset and drift of the amplifier. Charge injection from the integrated switches on the inputs can introduce very short transients in the input bias current of the amplifier. The extremely short duration of these pulses prevents the device from being amplified. However, the devices may be coupled to the output of the amplifier through the feedback network. The most effective method to prevent transients in the input bias current from producing additional noise at the amplifier output is to use a low-pass filter such as an RC network.

4. Layout Guidelines

For best operational performance of the device, use good printed circuit board (PCB) layout practices, including:

A.Place the external components as close to the device as possible. This configuration prevents parasitic errors (such as the Seebeck effect) from occurring.

B.To reduce parasitic coupling, run the input traces as far away from the supply lines and digital signal as possible.

C.Low-ESR, 0.1-µF ceramic bypass capacitors must be connected between each supply pin and ground, placed as close to the device as possible. A single bypass capacitor from V+ to ground is applicable to single supply applications.

D.Consider a driven, low-impedance guard ring around the critical traces. A guard ring can significantly reduce leakage currents from nearby traces that are at different potentials.

5. Low-side Current Monitor

Figure 10. shows the AD855X configured in a low-side current-sensing application. Theload current (I_{LOAD}) creates a voltage drop across the shunt resistor (R_{SHUNT}). This voltage is amplified by the AD855X.

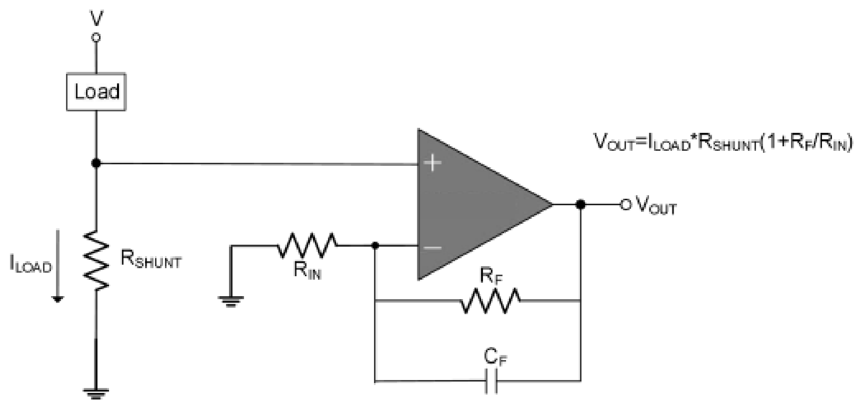


Figure10.Low-SideCurrentMonitor

6.Bridge Amplifier

Figure 11 .shows the basic configuration for a bridge amplifier.

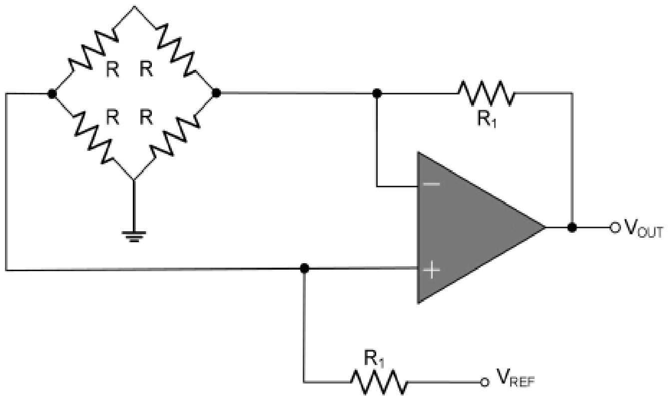


Figure 11. Bridge Amplifier

7. Programmable Power Supply

Figure 12. shows the AD855X configured as a precision programmable power supply using DAC and power amplifier. The AD855X in the front-end provides precision and low drift across a wide range of inputs and conditions.

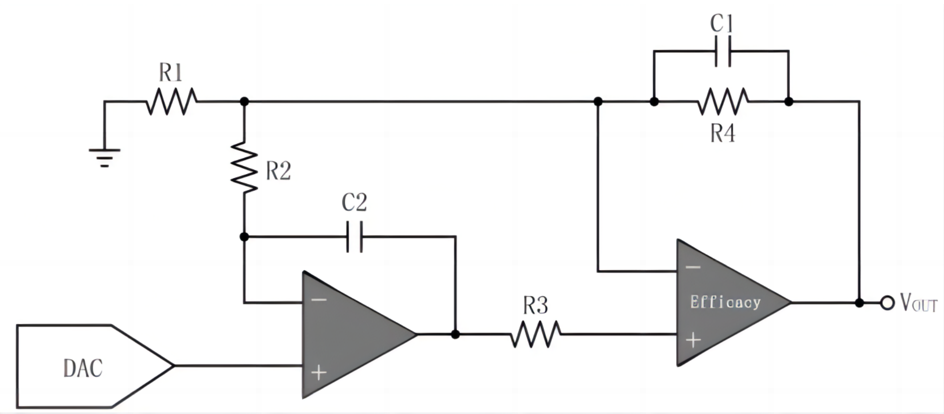
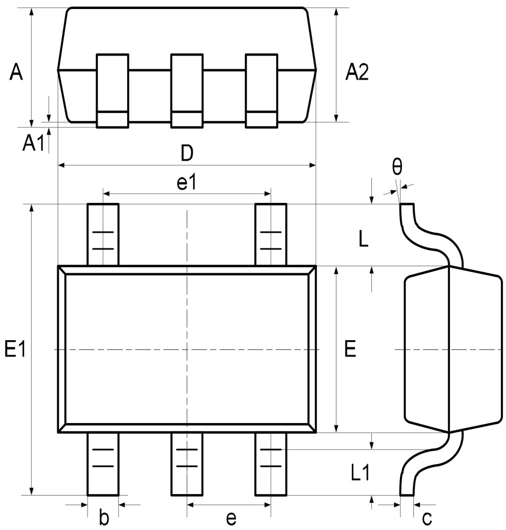


Figure 12.Programmable Power Supply

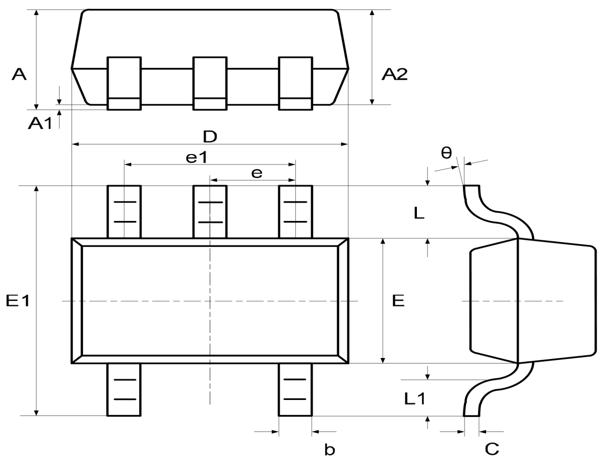
Package Information

SOT23-5



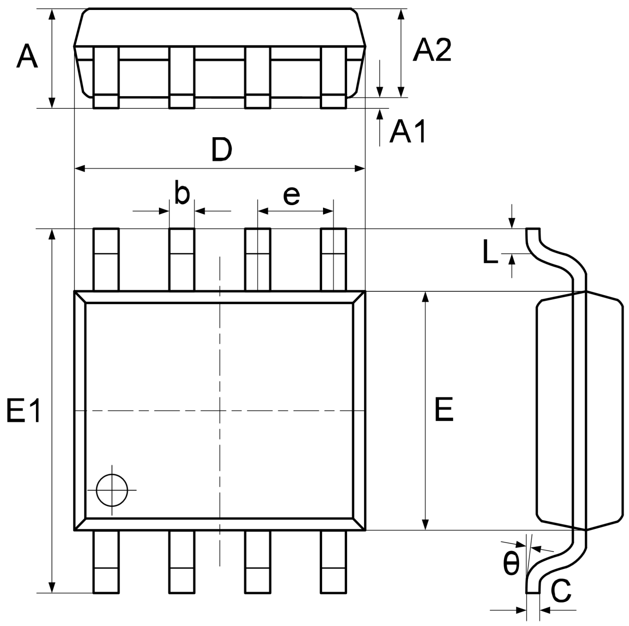
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.040	1.350	0.042	0.055
A1	0.040	0.150	0.002	0.006
A2	1.000	1.200	0.041	0.049
b	0.380	0.480	0.015	0.020
c	0.110	0.210	0.004	0.009
D	2.720	3.120	0.111	0.127
E	1.400	1.800	0.057	0.073
E1	2.600	3.000	0.106	0.122
e	0.950 typ.		0.037 typ.	
e1	1.900 typ.		0.078 typ.	
L	0.700 ref.		0.028 ref.	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SC70-5



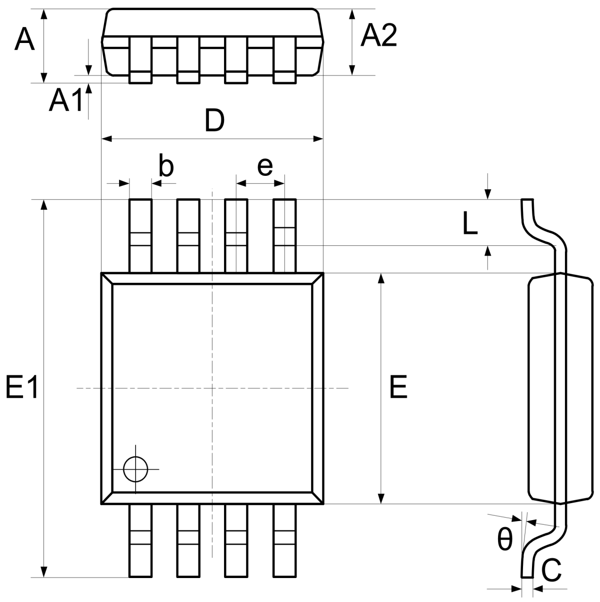
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	0.900	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	1.8500	2.150	0.079	0.087
E	1.100	1.400	0.045	0.053
E1	1.950	2.200	0.085	0.096
e	0.850 typ.		0.026 typ.	
e1	1.200	1.400	0.047	0.055
L	0.42 ref.		0.021 ref.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

SOP-8



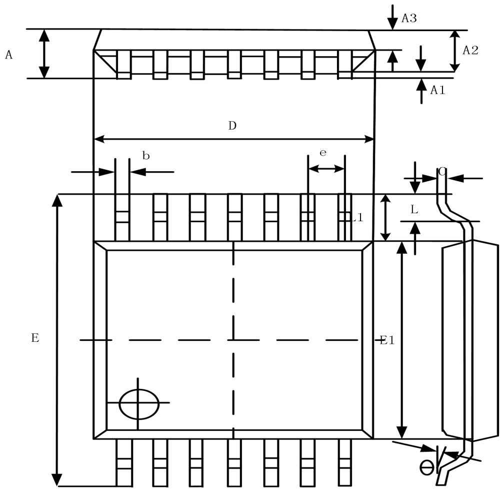
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.370	1.670	0.056	0.068
A1	0.070	0.170	0.003	0.007
A2	1.300	1.500	0.053	0.061
b	0.306	0.506	0.013	0.021
C	0.203 typ.		0.008 typ.	
D	4.700	5.100	0.192	0.208
E	3.820	4.020	0.156	0.164
E1	5.800	6.200	0.237	0.253
e	1.270 typ.		0.050 typ.	
L	0.450	0.750	0.018	0.306
θ	0°	8°	0°	8°

MSOP-8



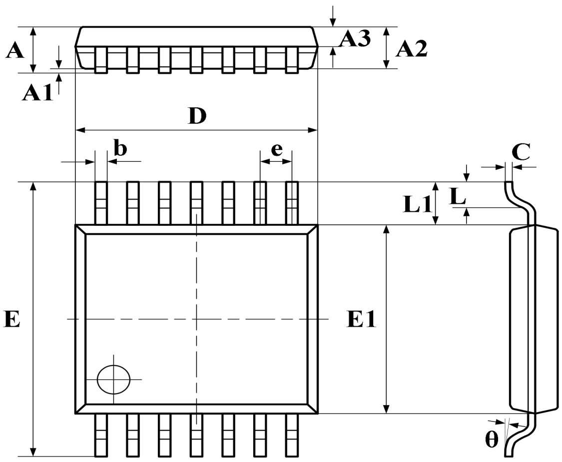
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.033	0.045
A1	0.050	0.150	0.002	0.006
A2	0.750	0.950	0.031	0.039
b	0.290	0.380	0.012	0.016
C	0.150	0.200	0.006	0.008
D	2.900	3.100	0.118	0.127
E	2.900	3.100	0.118	0.127
E1	4.700	5.100	0.192	0.208
e	0.650 typ.		0.026 typ.	
L	0.400	0.700	0.016	0.029
θ	0°	8°	0°	8°

SOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.850	0.059	0.076
A1	0.100	0.300	0.004	0.012
A2	1.350	1.550	0.055	0.063
A3	0.550	0.750	0.022	0.031
b	0.406typ.		0.017typ.	
C	0.203typ.		0.008typ.	
D	8.630	8.830	0.352	0.360
E	5.840	6.240	0.238	0.255
E1	3.850	4.050	0.157	0.165
e	1.270 typ.		0.050 typ.	
L1	1.040 ref.		0.041 ref.	
L	0.350	0.750	0.014	0.031
θ	2°	8°	2°	8°

TSSOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-	1.200	-	0.0472
A1	0.050	0.150	0.002	0.006
A2	0.900	1.050	0.037	0.043
A3	0.390	0.490	0.016	0.020
b	0.200	0.290	0.008	0.012
C	0.130	0.180	0.005	0.007
D	4.860	5.060	0.198	0.207
E	6.200	6.600	0.253	0.269
E1	4.300	4.500	0.176	0.184
e	0.650 typ.		0.0256 typ.	
L1	1.000 ref.		0.0393 ref.	
L	0.450	0.750	0.018	0.031
θ	0°	8°	0°	8°

Statement:

- XBLW reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.

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