CoreadDvices
承芯微电子

CD8551_CD8552_CD8554

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

Version: Rev 1.0.0 Date: 2025-5-26

Features

- Single-Supply Operation from +2.7V~+5.5V
- Rail-to-Rail Input / Output
- Gain-Bandwidth Product: 5MHz (Typ.@25°C)
- Low Input Bias Current: 50pA (Typ.@25°C)
- Low Offset Voltage: 1μV (Typ. @25°C)
- Quiescent Current: 640μA per Amplifier (Typ)
- Operating Temperature: -40°C~+125°C
- Input Offset Drift: 0.005μV/°C
- High Gain,CMRR,PSRR:130dB
- High Slew Rate: 1.9V/μs
- Low Noise: 0.75μVp-p (0.01Hz~10Hz)

Application

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

Description

CD855X series products include: CD8551, CD8552, CD8554.The CD855X amplifier is single/dual/quad channel amplifiers.

These products are micro-power, zero-drift CMOS operational amplifiers, the amplifiers offer bandwidth of 5MHz, rail-to-rail inputs and outputs,and single-supply operation from 2.7V to 5.5V. CD855X uses chopper stabilized technique to provide very low offset voltage (1μV typ) and near zero drift over temperature. Low quiescent supply current of 640μA per amplifier and very low input offset voltage, low bias current of 50pA make the devices an ideal choice for low offset, low power consumption and high impedance applications. The CD855X offers excellent CMRR without the crossover associated with traditional complementary input stages. This design results in superior performance for driving analog-to-digital converters (ADC) without degradation of differential linearity.

The CD8551 is available in SOT23-5 and SOP-8 packages. And the CD8552 is available in MSOP-8,SOP-8 and TSSOP8 packages. The CD8554 Quad is available in Green SOP-14 and TSSOP-14 packages. The extended temperature range of -40℃ to +125℃ over all supply voltages offers additional design flexibility.

Chinese version:CD8551_CD8552_CD8554

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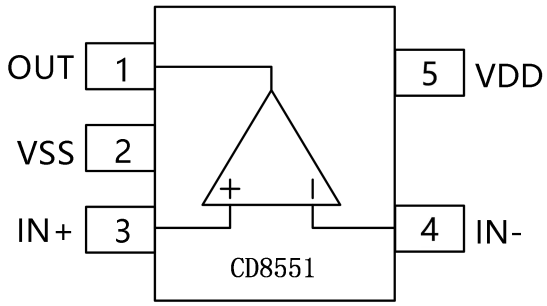
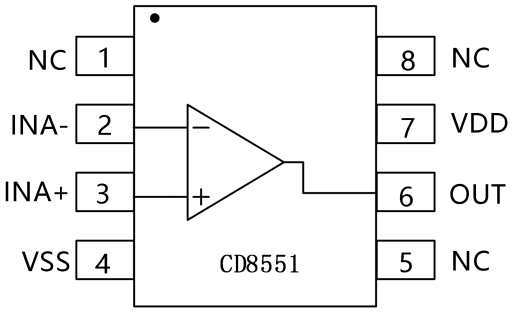
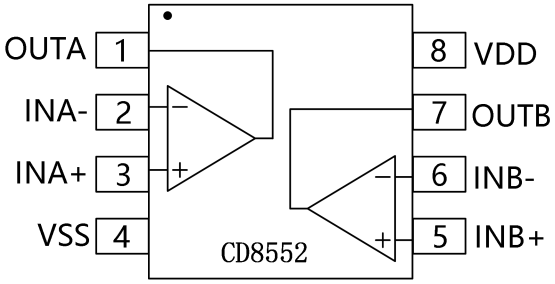
Pin Configurations



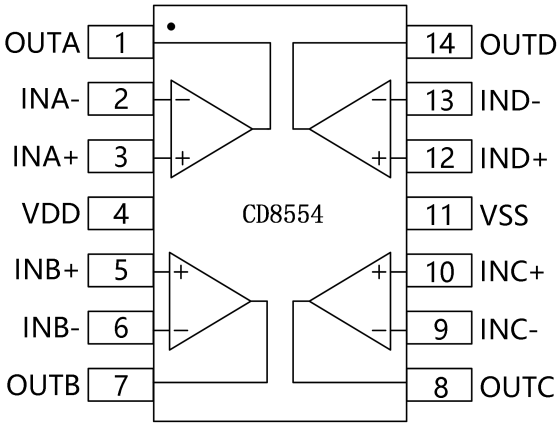
SOT23-5



SOP-8



MSOP-8 / SOP-8/TSSOP8



SOP-14 / TSSOP-14

Pin Description

Pin_N	Symbol SOT23-5 (CD8551)	Input/Output	Function
1	OUT	O	Output
2	VSS	--	Negative power supply
3	IN+	I	None Inverting input
4	IN-	I	Inverting input
5	VDD	--	Positive power supply
Pin_N	**Symbol SOP-8 (CD8551)**	**Input/Output**	**Function**
1	NC	--	No connect
2	INA-	I	inverting input A
3	INA+	I	None inverting input A
4	VSS	--	Negative power supply
5	NC	--	No connect
6	OUT	I	inverting input B
7	VDD	--	Positive power supply

8	NC	--	No connect
Pin_N	**Symbol MSOP-8/SOP-8/TSSOP-8 (CD8552)**	**Input/Output**	**Function**
1	OUTA	O	Output A
2	INA-	I	inverting input A
3	INA+	I	None inverting input A
4	VSS	--	Negative power supply
5	INB+	I	None inverting input B
6	INB-	I	inverting input B
7	OUTB	O	Output B
8	VDD	--	Positive power supply
Pin_N	**Symbol TSSOP-14/SOP-14 (CD86554)**	**Input/Output**	**Function**
1	OUTA	O	Output A
2	INA-	I	inverting input A
3	INA+	I	None inverting input A
4	VDD	--	Positive power supply
5	INB+	I	None inverting input B
6	INB-	I	inverting input B
7	OUTB	O	Output B
8	OUTC	O	Output C
9	INC-	I	inverting input C
10	INC+	I	None inverting input C
11	VSS	--	Negative power supply
12	IND+	I	None inverting input D
13	IND-	I	inverting input D
14	OUTD	O	Output D

Absolute Maximum Ratings

Parameter	Rating
Power Supply Voltage	7V
Analog Input Voltage (IN+ or IN-)	VSS-0.5V to VDD+0.5V
Differential Input Voltage	±5V
Operating Temperature Range	-40℃ to +125℃
Junction Temperature	-65℃ to 150℃
Storage Temperature Range	-65℃ to 150℃
Lead Temperature (soldering, 10sec)	260℃
Package Thermal Resistance (T_A=+25℃)	
SOT23-5, θ_{JA}	190℃/W
SOP-8, θ_{JA}	158℃/W
MSOP-8, θ_{JA}	190℃/W
SOP-14,θ_{JA}	120℃/W

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TSSOP-14,θ_{JA}	180℃/W
ESD Susceptibility	
HBM	5KV

Electrical characteristics

V_S=+5V, V_{CM}=+2.5V, V_O=+2.5V, T_A=+25℃,unless otherwise noted.

PARAMETER	CONDITION	CD8551/CD8552/CD8554			
		MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS					
Input Offset Voltage (V_{OS})	--	--	1	5	μV
Input Bias Current (I_B)	--	--	50	150	pA
Input Offset Current (I_{OS})	--	--	30	100	pA
Common-Mode Rejection Ratio (CMRR)	V_{CM} = 0V to 5V	105	132	--	dB
Large Signal Voltage Gain (A_{VO})	R_L = 10kΩ, V_O = 0.3V to 4.7V	105	135	--	dB
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)	−40°C ≤ T_A ≤ +125°C	--	0.005	0.04	μV/℃
OUTPUT CHARACTERISTICS					
Output Voltage High (V_{OH})	R_L = 100kΩ to -V_S	4.99	4.998	--	V
	R_L = 10kΩ to -V_S	4.95	4.98	--	V
Output Voltage Low (V_{OL})	R_L = 100kΩ to +V_S	--	1	10	mV
	R_L = 10kΩ to +V_S	--	10	30	mV
Short Circuit Limit (I_{SC})	--	25	50	--	mA
Output Current (I_O)	--	--	30	--	mA
POWER SUPPLY					
Power Supply Rejection Ratio (PSRR)	V_S = 2.7V to 5.5V,V_{CM}=0	105	132	--	dB
Quiescent Current/Per Amplifier (I_Q)	V_O = 0V, R_L = 0Ω	--	640	900	μA
DYNAMIC PERFORMANCE					
Gain-Bandwidth Product (GBP)	--	4	5	6	MHz
Slew Rate (SR)	--	1	1.9	3	V/μs
Overload Recovery Time	--	--	0.05	0.3	ms
NOISE PERFORMANCE					

Voltage Noise (en p-p)	0Hz to 10Hz	--	0.75	--	μV p-p
Voltage Noise Density (en)	f = 1kHz	--	35	--	nV/√Hz

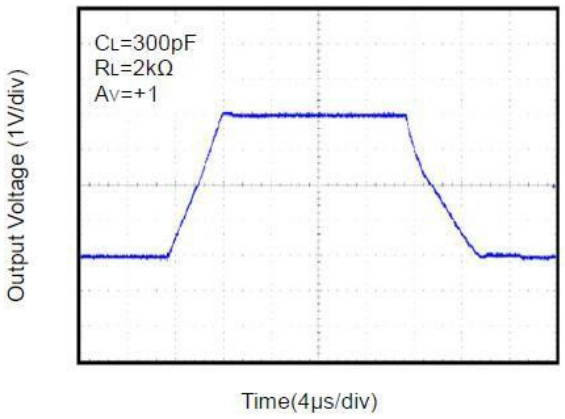
V_S=+2.7V, V_{CM}=+1.35V, V_O=+1.35V, T_A=+25℃,unless otherwise noted.

PARAMETER	CONDITION	CD8551/CD8552/CD8554			
		MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS					
Input Offset Voltage (V_{OS})	--	--	1	5	μV
Input Bias Current (I_B)	--	--	48	150	pA
Input Offset Current (I_{OS})	--	--	28	100	pA
Common-Mode Rejection Ratio (CMRR)	V_{CM} = 0V to 2.7V	105	130	--	dB
Large Signal Voltage Gain (A_{VO})	R_L = 10kΩ, V_O = 0.3V to 2.4V	105	132	--	dB
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)	−40°C ≤ T_A ≤ +125°C	--	0.005	0.04	μV/℃
OUTPUT CHARACTERISTICS					
Output Voltage High (V_{OH})	R_L = 100kΩ to - V_S	2.685	2.697	--	V
	R_L = 10kΩ to - V_S	2.67	2.68	--	V
Output Voltage Low (V_{OL})	R_L = 100kΩ to + V_S	--	1	10	mV
	R_L = 10kΩ to + V_S	--	10	30	mV
Short Circuit Limit (I_{SC})	--	10	15	--	mA
Output Current (I_O)	--	--	10	--	mA
POWER SUPPLY					
Power Supply Rejection Ratio (PSRR)	V_S = 2.7V to 5.5V	105	130	--	dB
Quiescent Current (I_Q)/Per Amplifier	V_O = 0V, R_L = 0Ω	--	620	880	μA
DYNAMIC PERFORMANCE					
Gain-Bandwidth Product (GBP)	--	4	4.9	6	MHz
Slew Rate (SR)	R_L = 10kΩ	1	1.8	3	V/μs
Overload Recovery Time	--	--	0.05	0.3	ms
NOISE PERFORMANCE					
Voltage Noise (en p-p)	0Hz to 10Hz	--	0.75	--	μVp-p
Voltage Noise Density (en)	f = 1kHz	--	35	--	nV/√Hz

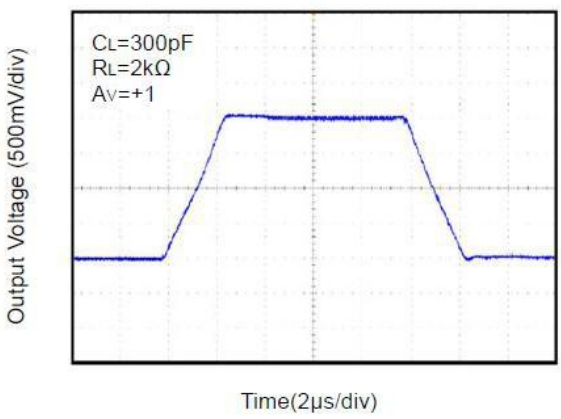
Typical Characteristics

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

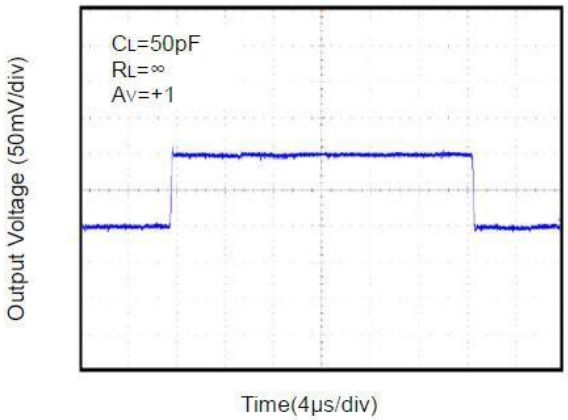
Large Signal Transient Response at +5V



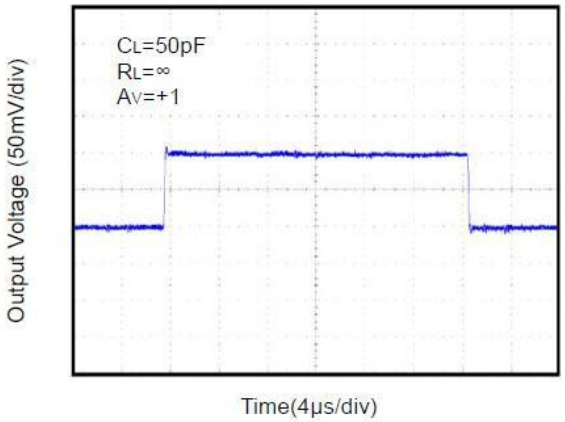
Large Signal Transient Response at +2.5V



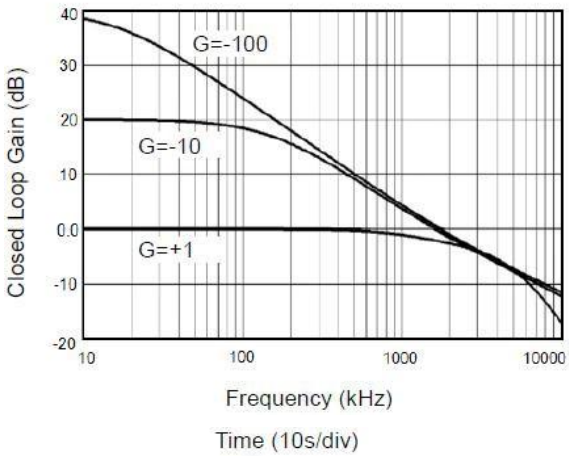
Small Signal Transient Response at +5V



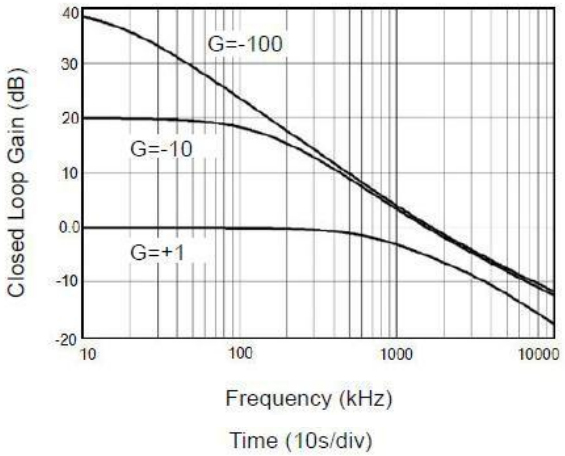
Small Signal Transient Response at +2.5V



Closed Loop Gain vs. Frequency at +5V



Closed Loop Gain vs. Frequency at +2.5V



Chinese version:CD8551_CD8552_CD8554

Application Information

Size

CD855X series op amps are unity-gain stable and suitable for a wide range of general-purpose applications. The small footprints of the CD855X series packages save space on printed circuit boards and enable the design of smaller electronic products.

Power Supply Bypassing and Board Layout

CD855X series operates from a single 2.7V to 5.5V supply or dual ±1.35V to ±2.75V supplies. For best performance, a 0.1μF ceramic capacitor should be placed close to the VDD pin in single supply operation. For dual supply operation, both VDD and VSS supplies should be bypassed to ground with separate 0.1μF ceramic capacitors.

Low Supply Current

The low supply current (typical 640uA per channel) of CD855X series will help to maximize battery life.They are ideal for battery powered systems

Operating Voltage

CD855X series operate under wide input supply voltage (2.7V to 5.5V). In addition, all temperature specifications apply from -40℃ to +125℃. Most behavior remains unchanged throughout the full operating voltage range. These guarantees ensure operation throughout the single Li-Ion battery lifetime

Rail-to-Rail Input

The input common-mode range of CD855X series extends 100mV beyond the supply rails (VSS-0.1V to VDD+0.1V). This is achieved by using complementary input stage. For normal operation, inputs should be limited to this range.

Rail-to-Rail Output

Rail-to-Rail output swing provides maximum possible dynamic range at the output. This is particularly important when operating in low supply voltages. The output voltage of CD855X series can typically swing to less than 5mV from supply rail in light resistive loads (>100kΩ), and 60mV of supply rail in moderate resistive loads (10kΩ).

Capacitive Load Tolerance

The CD855X family is optimized for bandwidth and speed, not for driving capacitive loads. Output capacitance will create a pole in the amplifier’ s feedback path, leading to excessive peaking and potential oscillation. If dealing with load capacitance is a requirement of the application, the two strategies to consider are using a small resistor in series with the amplifier’ s output and the load capacitance and reducing the bandwidth of the amplifier’ s feedback loop by increasing the overall noise gain. Figure 2. shows a unity gain follower using the series resistor

strategy. The resistor isolates the output from the capacitance and, more importantly, creates a zero in the feedback path that compensates for the pole created by the output capacitance.

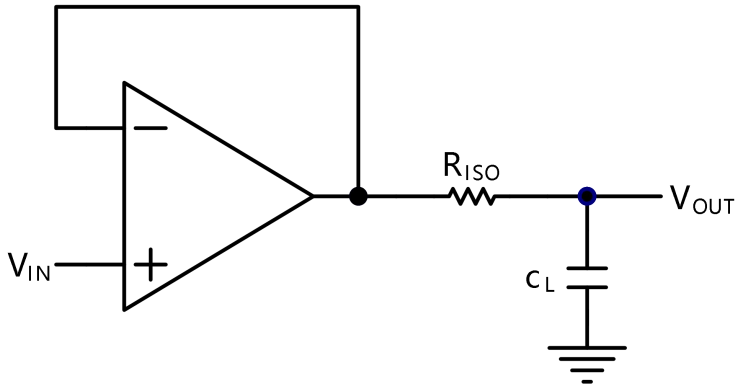


Figure 2. Indirectly Driving a Capacitive Load Using Isolation Resistor

The bigger the RISO resistor value, the more stable VOUT will be. However, if there is a resistive load RL in parallel with the capacitive load, a voltage divider (proportional to RISO/RL) is formed, this will result in a gain error.

The circuit in Figure 3 is an improvement to the one in Figure 2. RF provides the DC accuracy by feed-forward the VIN to RL. CF and RISO serve to counteract the loss of phase margin by feeding the high frequency component of the output signal back to the amplifier’ s inverting input, thereby preserving the phase margin in the overall feedback loop. Capacitive drive can be increased by increasing the value of CF. This in turn will slow down the pulse response.

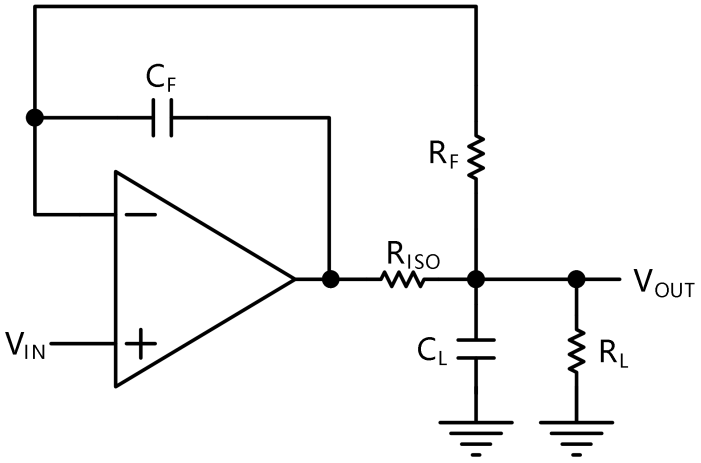
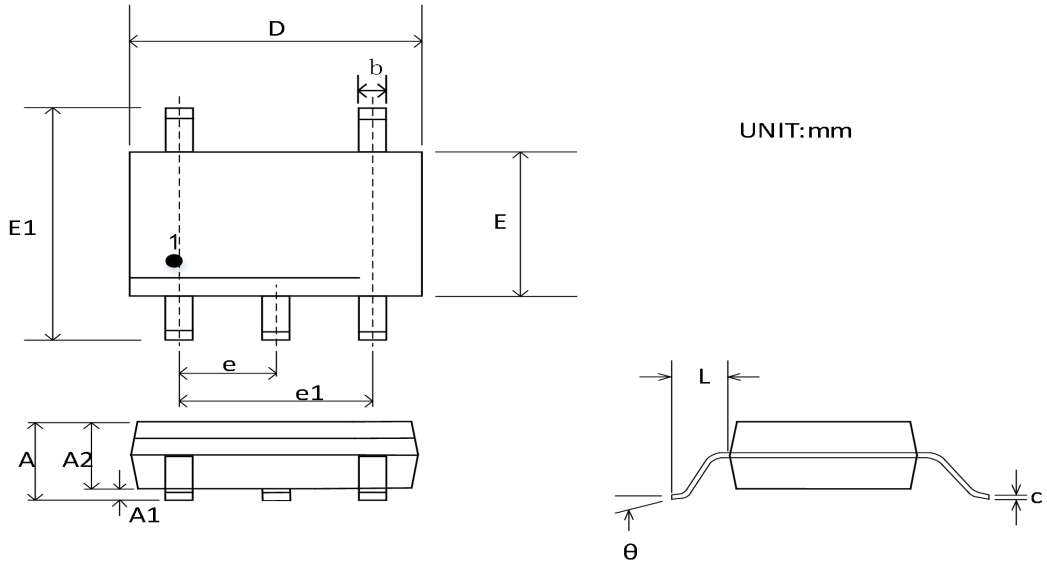


Figure 3. Indirectly Driving a Capacitive Load with DC Accuracy

Package Outline Dimensions

SOT23-5



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950 BSC	
e1	1.800	2.000
L	0.300	0.600
θ	0°	8°

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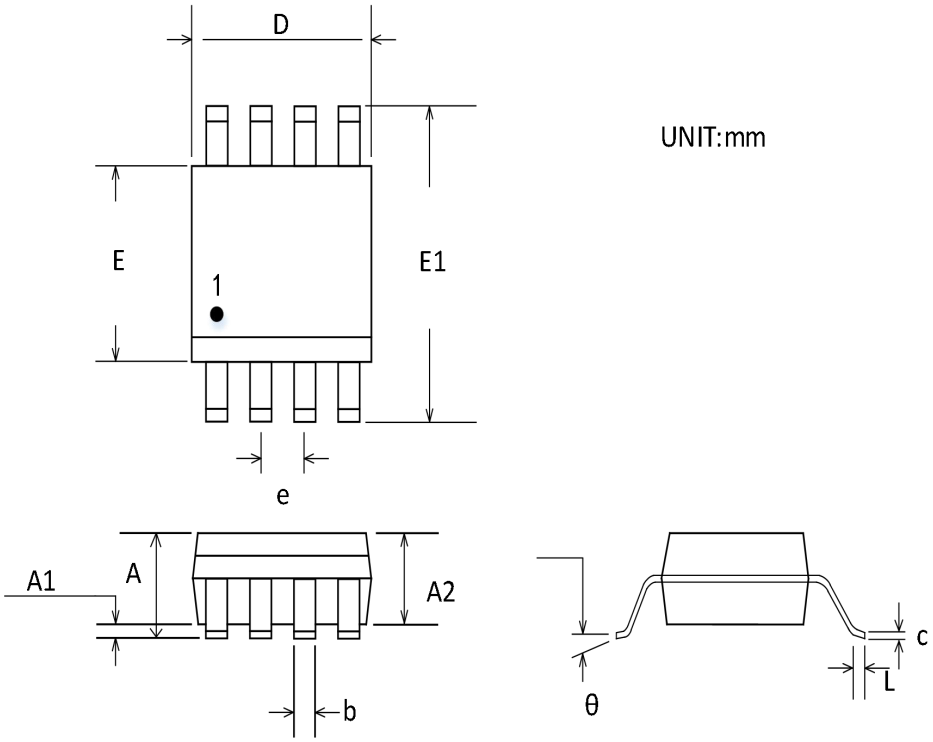
MSOP-8



UNIT:mm

Symbol	Dimensions In Millimeters	
	Min	Max
A	0.820	1.100
A1	0.020	0.150
A2	0.750	0.950
b	0.250	0.380
c	0.090	0.230
D	2.90	3.100
E	2.900	3.100
E1	4.750	5.050
e	0.650(BSC)	
L	0.400	0.800
θ	0°	6°

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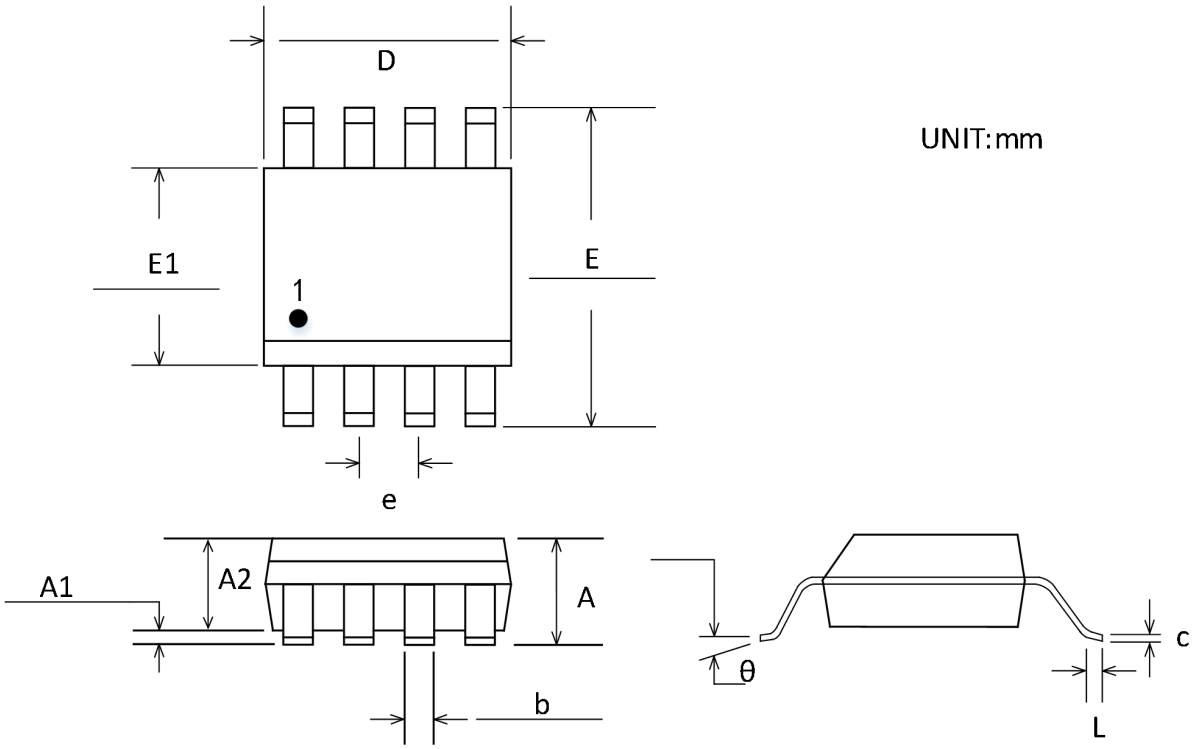
SOP-8



UNIT:mm

Symbol	Dimensions In Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.800	5.000
E	5.800	6.200
E1	3.800	4.000
e	1.27 (BSC)	
L	0.400	1.270
θ	0°	8°

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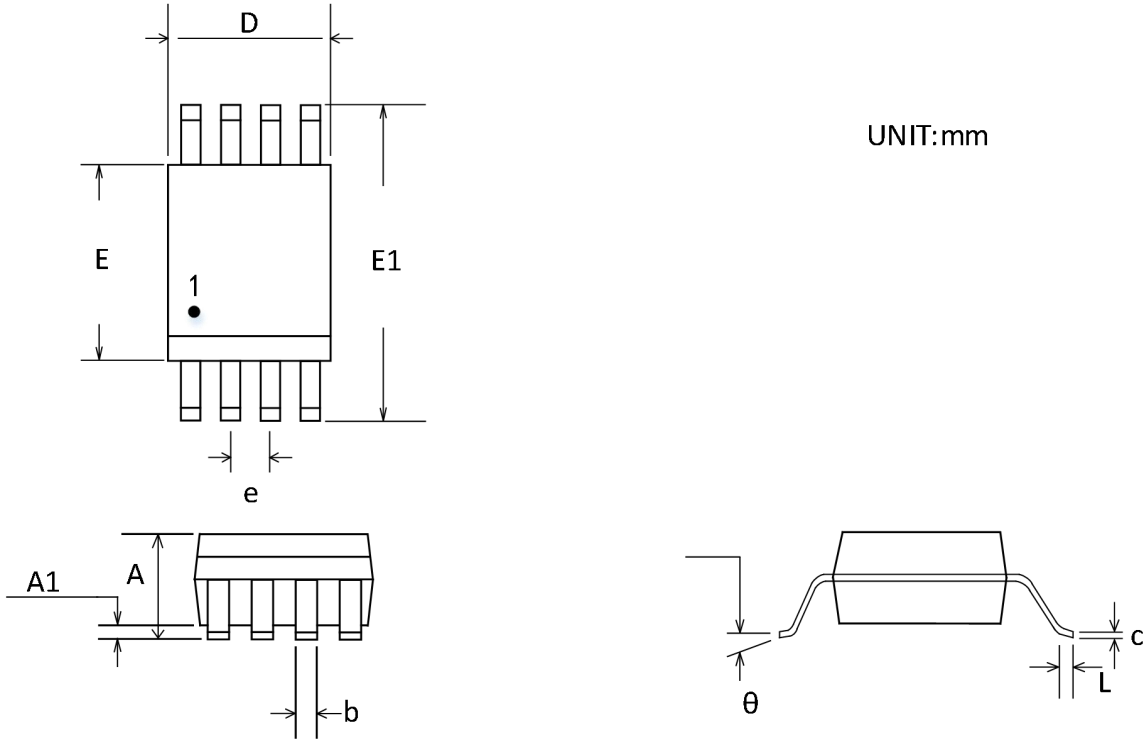
TSSOP-8

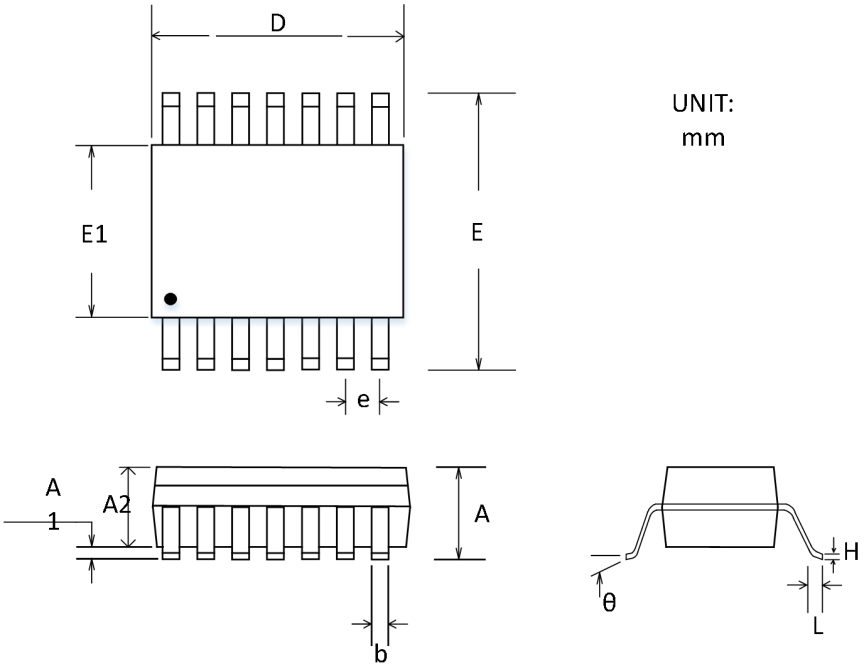


UNIT:mm

Symbol	Dimensions In Millimeters	
	Min	Max
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
c	0.09	0.20
D	2.90	3.10
E	4.30	4.50
E1	6.40BSC	
e	0.65 BSC	
L	0.45	0.75
θ	0°	8°

Chinese version:CD8551_CD8552_CD8554

TSSOP-14



UNIT:
mm

Symbol	Dimensions In Millimeters	
	Min	Max
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
c	0.09	0.20
D	2.90	3.10
E	4.30	4.50
E1	6.40BSC	
e	0.65 BSC	
L	0.45	0.75
θ	0°	8°

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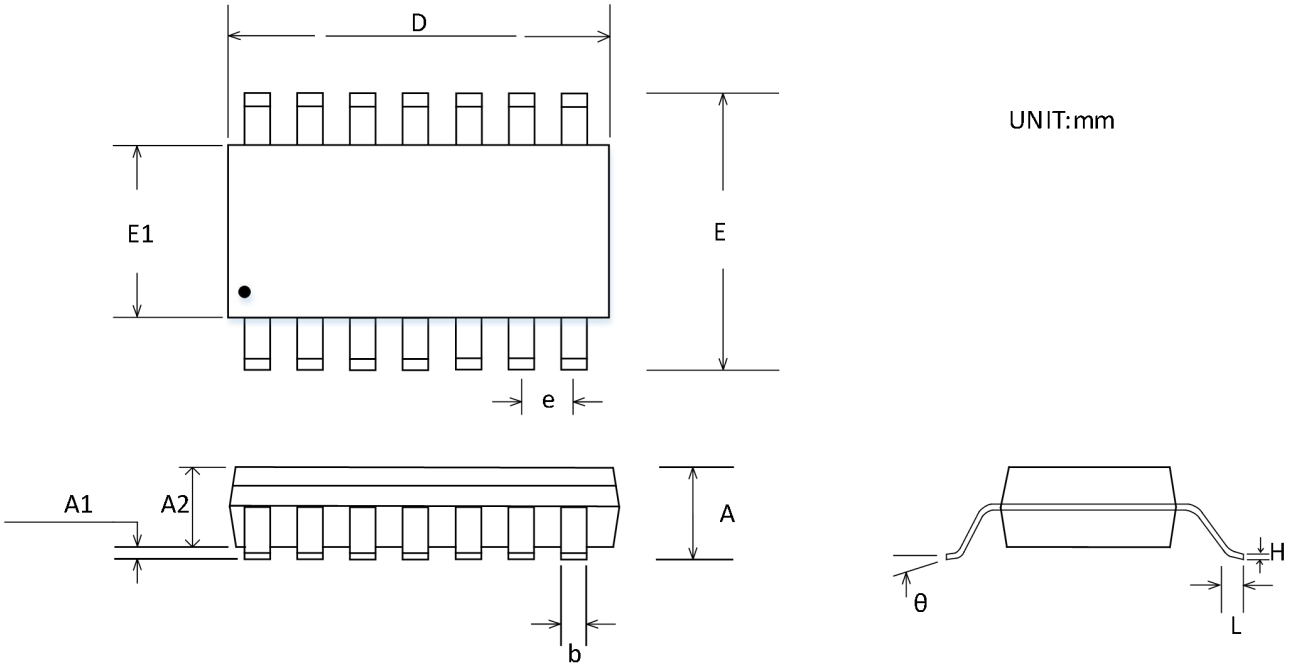
SOP-14



UNIT:mm

Symbol	Dimensions In Millimeters	
	Min	Max
A	1.35	1.75
A1	0.10	0.25
A2	1.25	1.50
b	0.31	0.51
D	8.55	8.75
E	5.80	6.20
E1	3.80	4.00
e	1.27BSC	
H	0.17	0.25
L	0.40	1.27
θ	0°	8°

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Package/Ordering Information

MODEL	TEMPERATURE	PACKAGE DESCRIPTION	PACKAGE OPTION
CD8551AST5	-40℃~125℃	SOT23-5	Tape and Reel, 3000
CD8551AS8	-40℃~125℃	SOP-8	Tape and Reel, 2500
CD8551AS8-RL	-40℃~125℃	SOP-8	Tape and Reel, 3000
CD8551AS8-REEL	-40℃~125℃	SOP-8	Tape and Reel, 4000
CD8551AMS8	-40℃~125℃	MSOP-8	Tape and Reel, 3000
CD8552AS8	-40℃~125℃	SOP-8	Tape and Reel, 2500
CD8552AS8-RL	-40℃~125℃	SOP-8	Tape and Reel, 3000
CD8552AS8-REEL	-40℃~125℃	SOP-8	Tape and Reel, 4000
CD8552AMS8	-40℃~125℃	MSOP-8	Tape and Reel, 3000
CD8552ATS8	-40℃~125℃	TSSOP-8	Tape and Reel, 2500
CD8552ATS8-RL	-40℃~125℃	TSSOP-8	Tape and Reel, 3000
CD8552ATS8-REEL	-40℃~125℃	TSSOP-8	Tape and Reel, 4000
CD8554ATS14	-40℃~125℃	TSSOP-14	Tape and Reel, 2500
CD8554ATS14-RL	-40℃~125℃	TSSOP-14	Tape and Reel, 3000
CD8554ATS14-REEL	-40℃~125℃	TSSOP-14	Tape and Reel, 4000
CD8554AS14	-40℃~125℃	SOP-14	Tape and Reel, 2500
CD8554AS14-RL	-40℃~125℃	SOP-14	Tape and Reel, 3000
CD8554AS14-REEL	-40℃~125℃	SOP-14	Tape and Reel, 4000

Revision Log

Version	Revision date	Change content	Reason for Change	Modified by	Reviewed By	Note
V1.0	2025.5.26	Initial version	Regular update	WW	LYL	

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