



CD8541 CD8542 CD8544

CMOS Rail-to-Rail General-Purpose Amplifiers

Version: Rev 1.0.0 Date: 2025-5-26

Features ■■

- Low supply current: 45 μ A/amplifier
- Single-supply operation: 2.7 V to 5.5 V
- High gain bandwidth : 1MHz
- Rail-to-rail input and output
- Low input currents: 4pA
- Unity gain stable

Application ■■

- ASIC input or output amplifiers
- Sensor interfaces
- Medical instrumentation
- Mobile communications
- Audio outputs
- Portable systems

Description ■■

The CD8541/CD8542/CD8544 are single, dual, and quad rail to-rail input and output, single-supply amplifiers featuring very low supply current and 1 MHz bandwidth. All are guaranteed to operate from a 2.7 V single supply as well as a 5 V supply. These parts provide 1 MHz bandwidth at a low current consumption of 45 μ A per amplifier.

Low input bias currents enable the CD8541/CD8542/CD8544 to be used for integrators, photodiode amplifiers, piezoelectric sensors, and other applications with high source impedance. The supply current is only 45 μ A per amplifier, ideal for battery operation.

Rail-to-rail inputs and outputs are useful to designers buffering ASICs in single-supply systems. The CD8541/CD8542/CD8544 are optimized to maintain high gains at lower supply voltages, making them useful for active filters and gain stages.

The CD8541/CD8542/CD8544 are specified over the extended industrial temperature range (–40°C to +125°C). The CD8541 is available in 5-lead SOT-23, 5-lead SC70, and 8-lead SOIC packages. The CD8542 is available in 8-lead SOIC, 8-lead MSOP, and 8-lead TSSOP surface-mount packages. The CD8544 is available in 14-lead narrow SOIC and 14-lead TSSOP surface-mount packages. All MSOP, SC70, and SOT versions are available in tape and reel only. See the Ordering Guide for automotive models.

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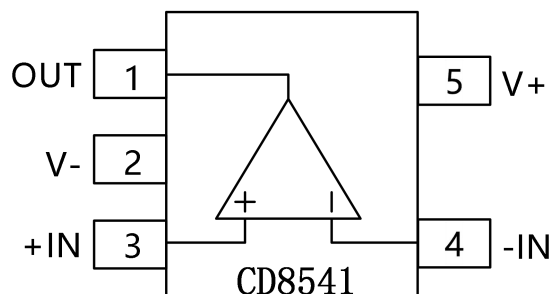
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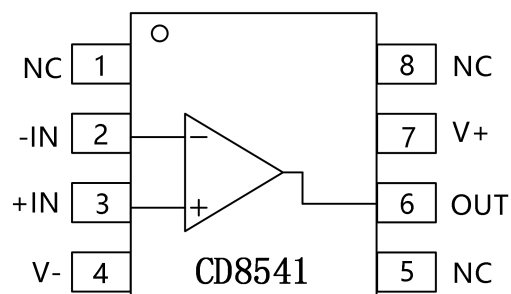
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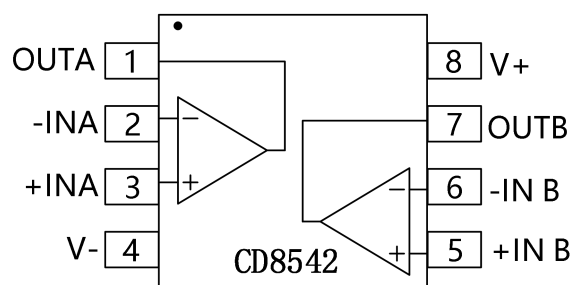
Pin Configurations



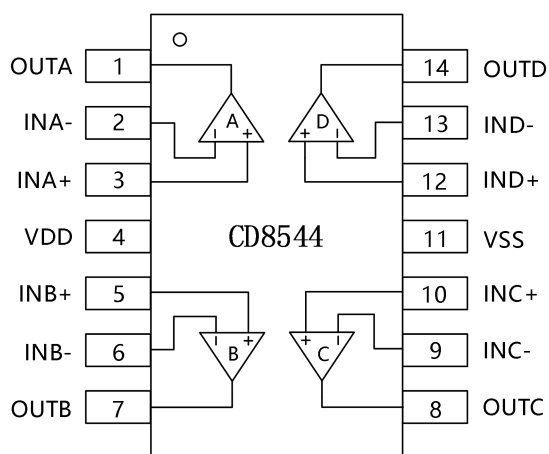
SC70-5/SOT23-5



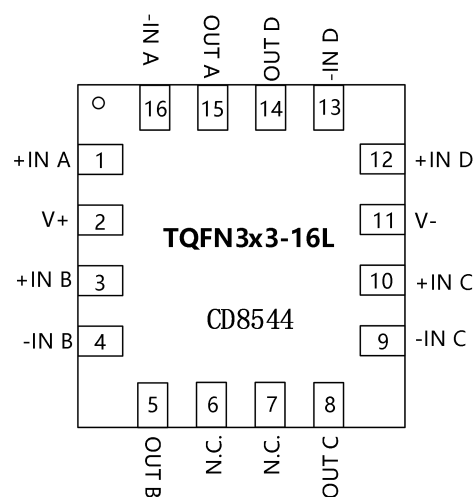
SOIC-8(SOP8)/MSOP-8



SOIC-8(SOP8)/MSOP-8/TSSOPP-8



SOIC-14(SOP14),TSSOP-14



TQFN3x3-16L

Note : NC indicates no internal connection

Absolute Maximum Ratings

Parameter	Range
Supply Voltage (VS)	6V
Input Voltage	GND to VS
Differential Input Voltage	±6 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−40°C to +125°C
Junction Temperature Range	−65°C to +150°C
Package Thermal Resistance (@ T _A = +25°C)	
SOT23-5.	190°C/W
SC70-5	376°C/W
SOP-8	120°C/W
MSOP-8	142°C/W
TSSOP-8	240°C/W
SOP-14	115°C/W
TSSOP-14	112°C/W
Lead Temperature (Soldering, 60s)	300°C
HBM	5000V
MM	400V

Electrical characteristics

VS = 5.0 V, VCM = 2.5 V, T_A = 25°C, unless otherwise noted.

Table1.

PARAMETER		CONDITIONS	CD8541/CD8542/CD8544			UNIT
			MIN	TYP	MAX	
POWER SUPPLY						
Vs	Operating Voltage Range		2.7	--	5.5	V
I _Q	Quiescent Current/Amplifier	V _O =0V	--	45	70	μA
PSRR	Power-Supply Rejection Ratio	Vs=2.5V to 6V	65	80	--	dB
INPUT CHARACTERISTICS						
V _{OS}	Input Offset Voltage		--	1	6	mV
ΔV _{OS} /ΔT	Input Offset Voltage Average Drift	-40°C to 125°C	--	4	--	μV/°C
I _B	Input Bias Current		--	4	60	pA
I _{OS}	Input Offset Current		--	0.1	30	pA
CMRR	Common-Mode Rejection Ratio	V _{CM} =0V to 5V	40	50	--	dB
A _{VO}	Open-Loop Voltage Gain	R _L = 100 kΩ, V _O = 0.5 V	20	42	--	V/mV

		to 2.2 V				
OUTPUT CHARACTERISTICS						
V _{OH}	Output Voltage High	I _L = 1 mA	4.9	4.965	--	V
V _{OL}	Output Voltage Low	I _L = 1 mA	--	25	100	mV
I _{OUT}	Output Current	V _{OUT} = V _S - 1 V	--	30	--	mA
I _{SC}	Output Short-Circuit Current		--	±60	--	mA
Z _{OUT}	Closed-Loop Output Impedance	f = 200 kHz, A _V = 1	--	45	--	Ω
DYNAMIC PERFORMANCE						
SR	Slew Rate	R _L = 100 kΩ, C _L = 200pF	0.45	0.7	--	V/μs
GBP	Gain-Bandwidth Product		--	1	--	MHz
P _M	Phase Margin		--	67	--	°
t _s	Setting Time	To 0.1% (1V step)	--	6	--	μs
NOISE PERFORMANCE						
e _n	Input Voltage Noise Density	f = 1KHz	--	42	--	nV/√Hz
		f = 10KHz	--	38	--	nV/√Hz

V_S = 2.7 V, V_{CM} = 1.35 V, T_A = 25°C, unless otherwise noted.

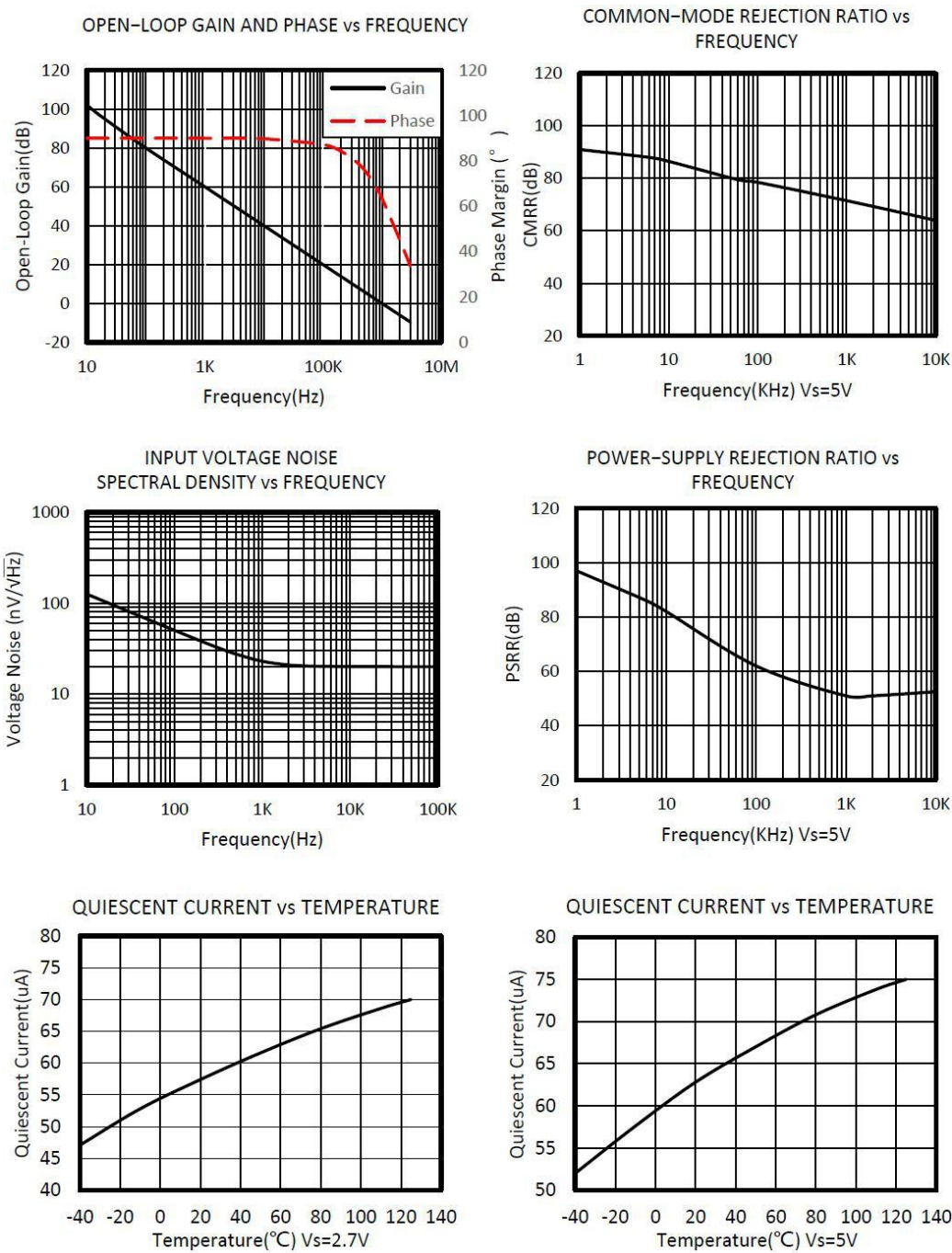
Table2.

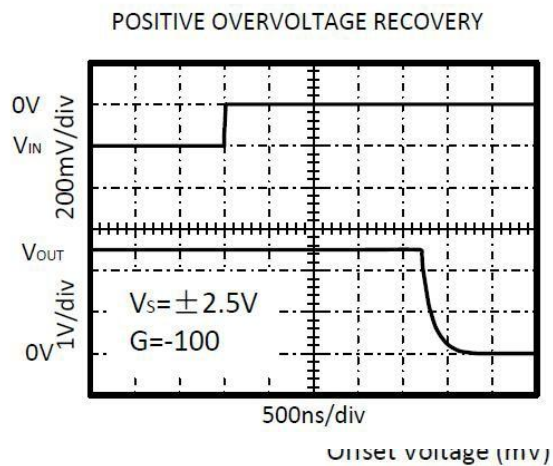
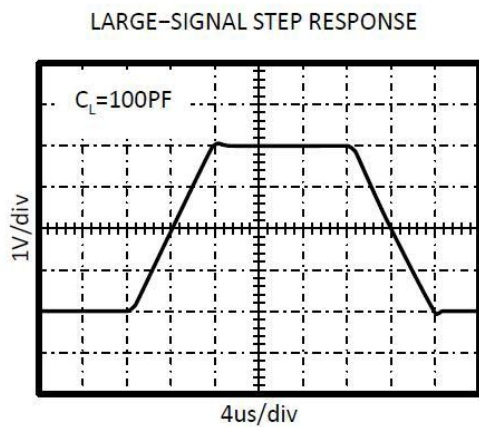
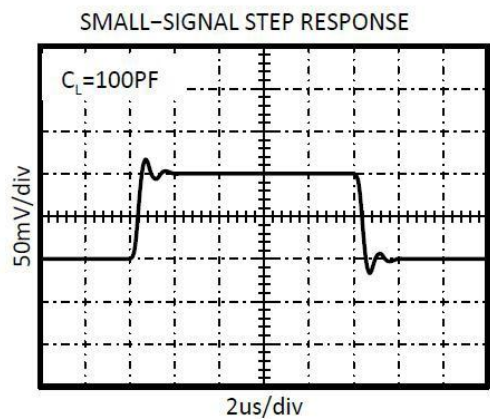
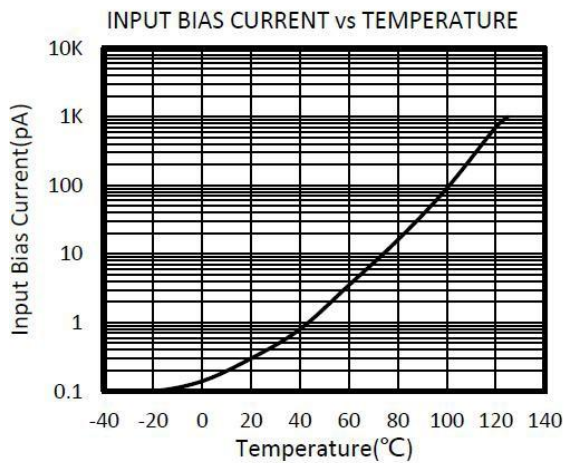
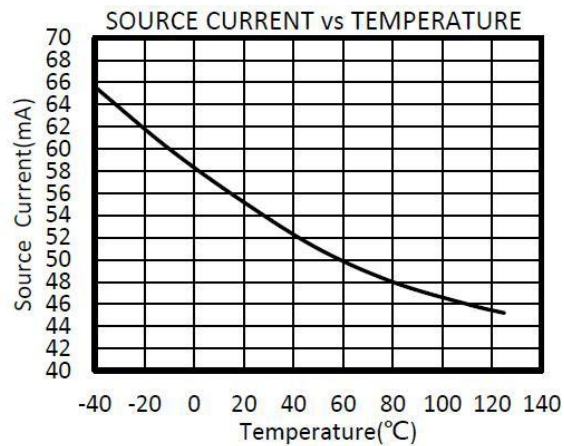
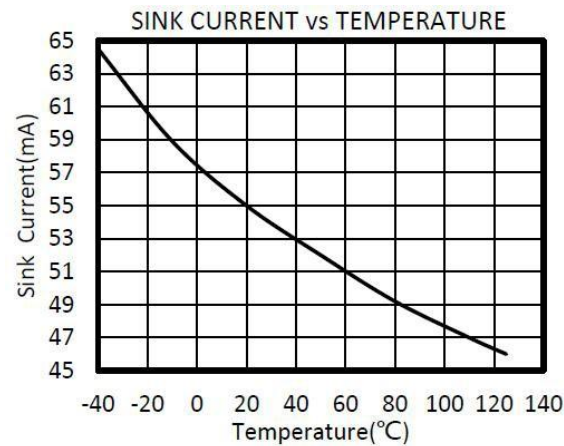
PARAMETER		CONDITIONS	CD8541/CD8542/CD8544			UNIT
			MIN	TYP	MAX	
POWER SUPPLY						
I _Q	Quiescent Current/Amplifier	V _O =0V	--	35	55	μA
PSRR	Power-Supply Rejection Ratio	V _S =2.5V to 6V	65	78	--	dB
INPUT CHARACTERISTICS						
V _{OS}	Input Offset Voltage		--	1	6	mV
ΔV _{OS} /ΔT	Input Offset Voltage Average Drift	-40°C to 125°C	--	4	--	μV/°C
I _B	Input Bias Current		--	4	60	pA
I _{OS}	Input Offset Current		--	0.1	30	pA
CMRR	Common-Mode Rejection Ratio	V _{CM} =0V to 2.7V	40	48	--	dB
A _{VO}	Open-Loop Voltage Gain	R _L = 100 kΩ, V _O = 0.5 V to 2.2 V	90	500	--	V/mV
OUTPUT CHARACTERISTICS						
V _{OH}	Output Voltage High	I _L = 1 mA	2.575	2.65	--	V
V _{OL}	Output Voltage Low	I _L = 1 mA	--	35	100	mV
I _{OUT}	Output Current	V _{OUT} = V _S - 1 V	--	15	--	mA
I _{SC}	Output Short-Circuit Current		--	±20	--	mA
Z _{OUT}	Closed-Loop Output Impedance	f = 200 kHz, A _V = 1	--	50	--	Ω
DYNAMIC PERFORMANCE						
SR	Slew Rate	R _L = 100 kΩ	0.4	0.7	--	V/μs
GBP	Gain-Bandwidth Product		--	0.98	--	MHz
P _M	Phase Margin		--	63	--	°

ts	Setting Time	To 0.1% (1V step)	--	5	--	μs
NOISE PERFORMANCE						
en	Input Voltage Noise Density	f = 1KHz	--	40	--	nV/√Hz
		f = 10KHz	--	38	--	nV/√Hz

Typical Characteristics

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





Application Notes

The CD8541, CD8542, CD8544 are high precision, rail-to-rail operational amplifiers that can be run from a single-supply voltage 2.7V to 5.5V ($\pm 1.35\text{V}$ to $\pm 2.75\text{V}$). Supply voltages higher than 6V (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.

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 0.1 μF 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.

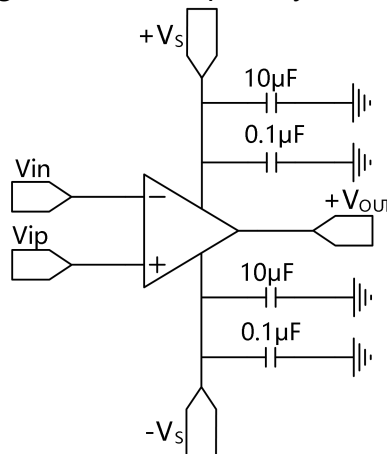


Figure 1. Amplifier with Bypass Capacitors

Instrumentation Amplifier

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

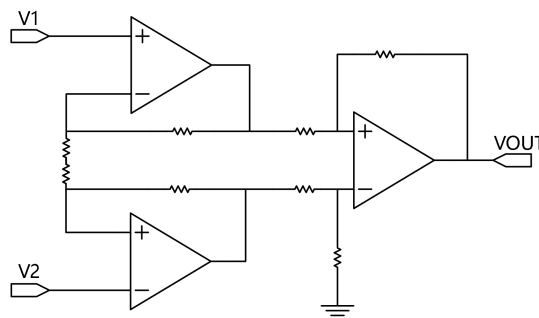
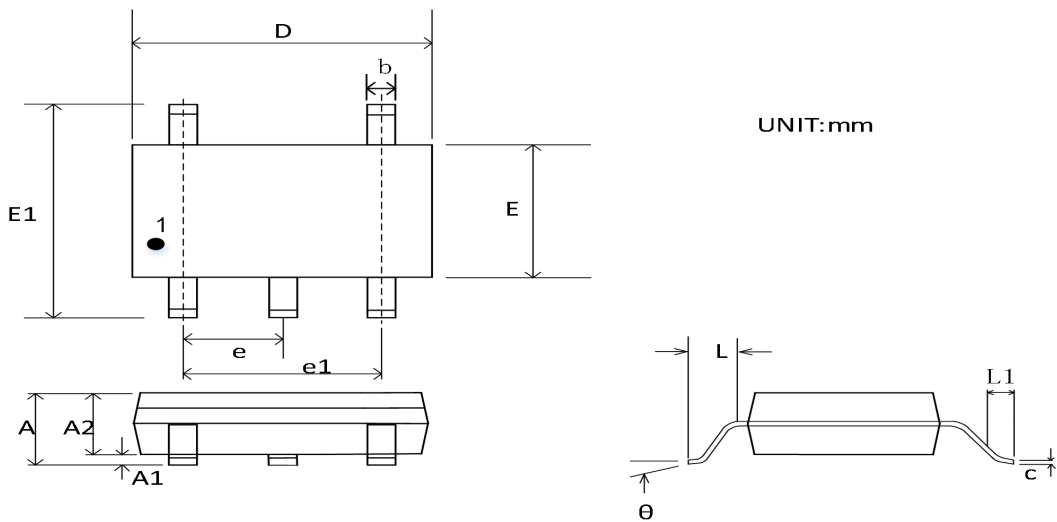


Figure2. Amplifier instrumentation amplifier

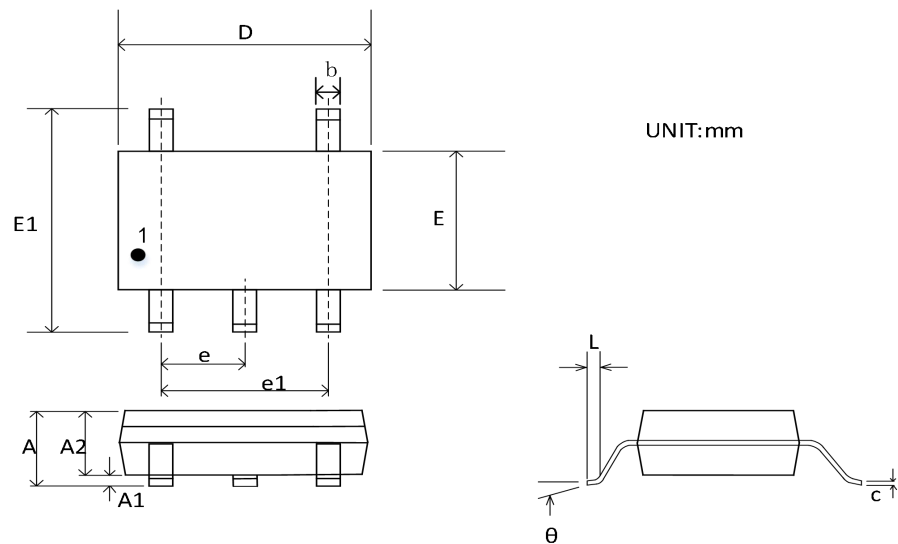
Package Outline Dimensions

SC70-5



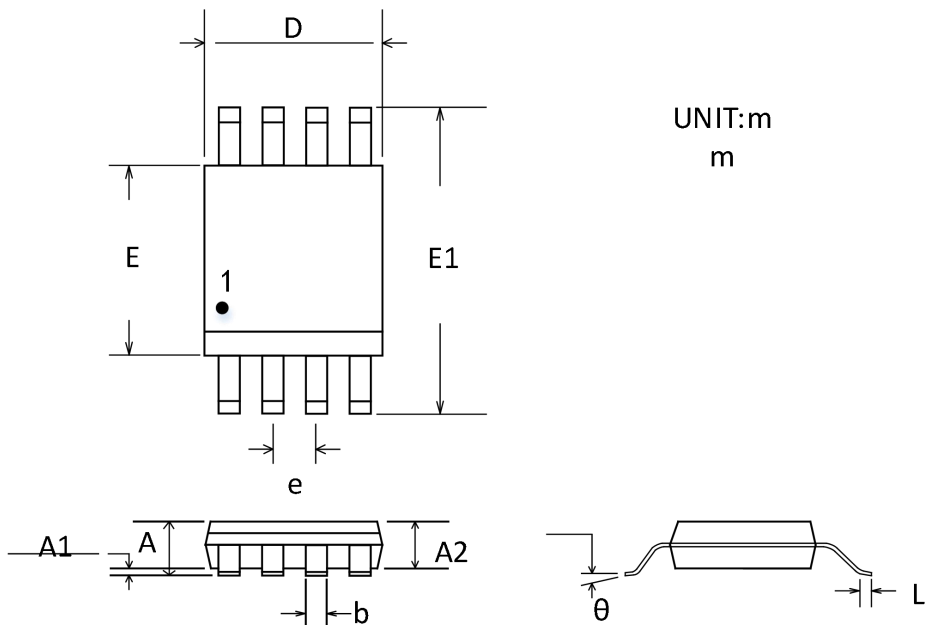
Symbol	Dimensions In Millimeters	
	Min	Max
A	0.800	1.100
A1	0.000	0.100
A2	0.700	1.000
b	0.150	0.300
c	0.080	0.220
D	1.800	2.200
E	1.150	1.350
E1	1.800	2.400
e	0.650 BSC	
e1	1.200	1.400
L	0.525 REF	
L1	0.260	0.460
θ	0°	8°

SOT23-5



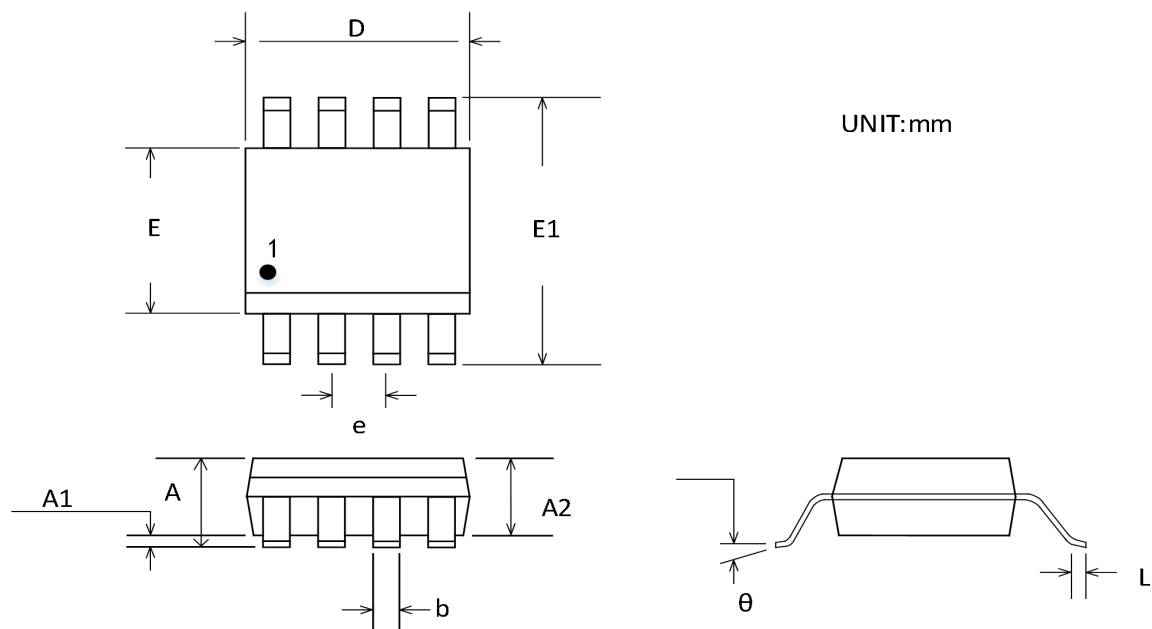
Symbol	Dimensions In Millimeters	
	Min	Max
A	--	1.450
A1	--	0.150
A2	0.900	1.300
b	0.300	0.500
c	0.080	0.220
D	2.900 BSC	
E	1.600 BSC	
E1	2.80 BSC	
e	0.950 BSC	
e1	1.900 BSC	
L	0.300	0.600
θ	0°	8°

MSOP-8



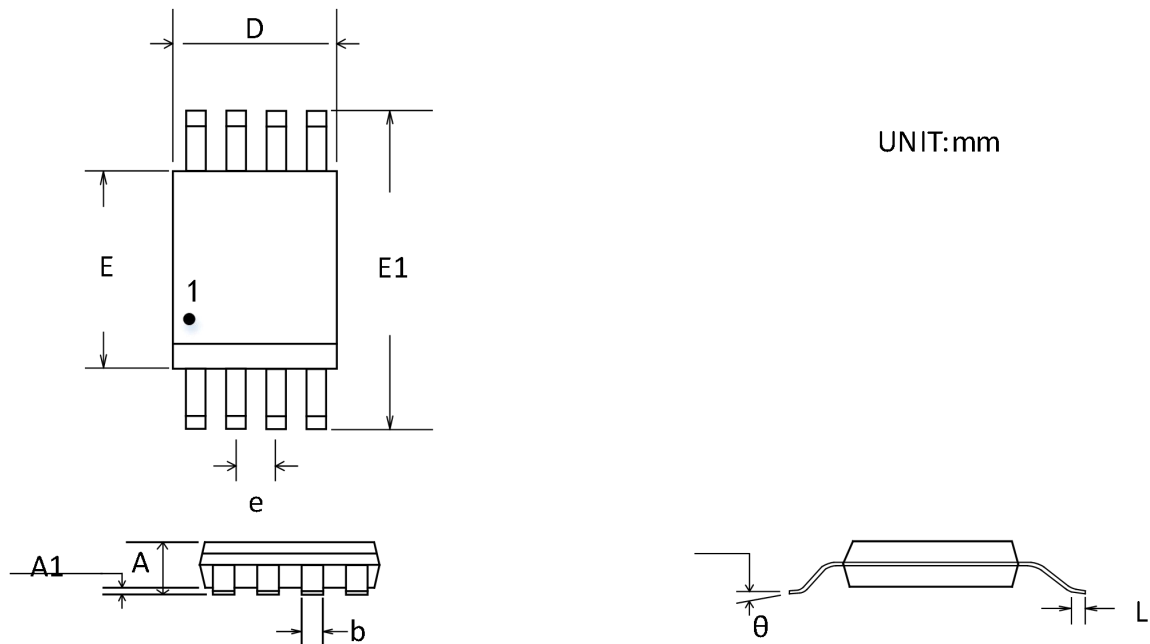
Symbol	Dimensions In Millimeters	
	Min	Max
A	0.820	1.100
A1	0.000	0.150
A2	0.750	0.950
b	0.220	0.380
D	2.800	3.200
E	2.800	3.200
E1	4.650	5.150
e	0.650 BSC	
L	0.400	0.800
θ	0°	8°

SOP-8



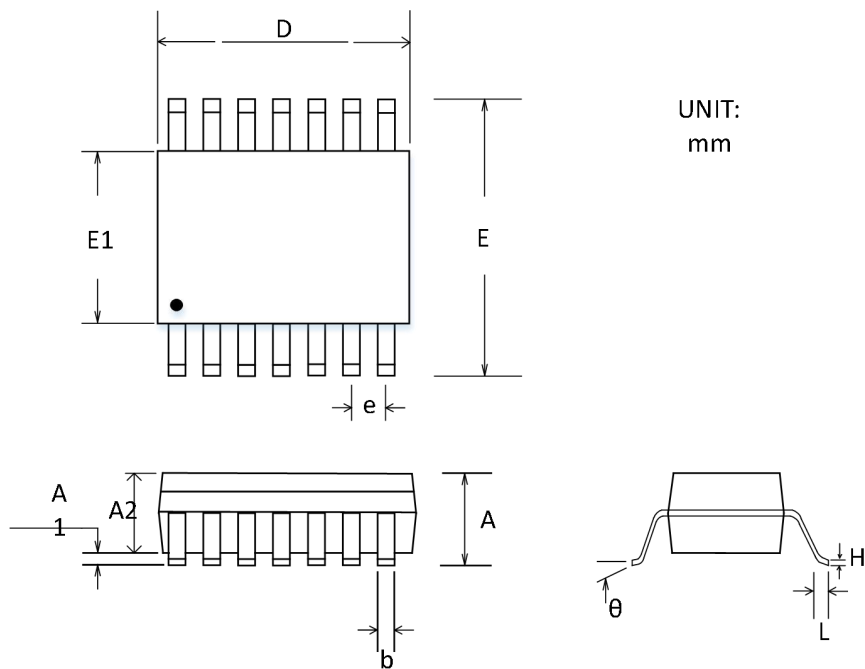
Symbol	Dimensions In Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.310	0.510
D	4.800	5.000
E	3.800	4.000
E1	5.800	6.200
e	1.270 BSC	
L	0.400	1.270
θ	0°	8°

TSSOP-8



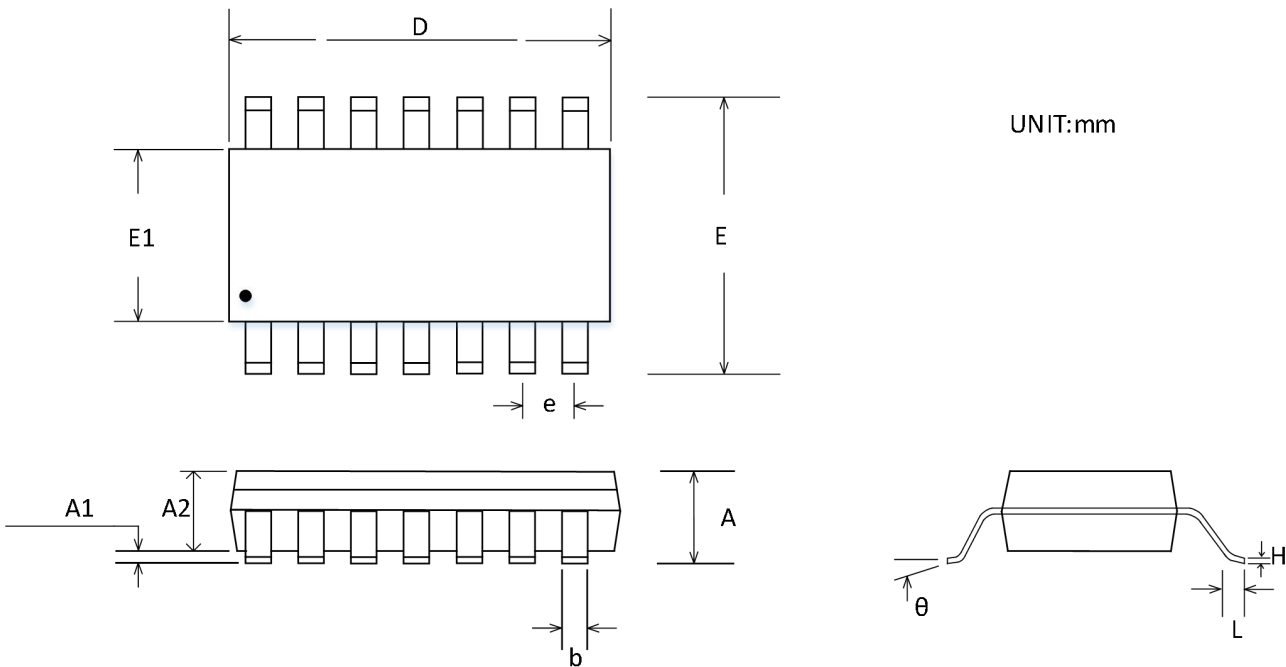
Symbol	Dimensions In Millimeters	
	Min	Max
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
D	2.90	3.10
E	4.30	4.50
E1	6.40BSC	
e	0.65 BSC	
L	0.45	0.75
θ	0°	8°

TSSOP-14



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.20MAX	
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
D	4.90	5.10
E	6.40BSC	
E1	4.30	4.50
e	0.65BSC	
H	0.09	0.20
L	0.45	0.75
θ	0°	8°

SOP-14



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°

Package/Ordering Information

MODEL	TEMPERATURE	PACKAGE DESCRIPTION	PACKAGE OPTION
CD8531ASC7	-40°C~125°C	SC70-5	Tape and Reel,3000
CD8531AST5	-40°C~125°C	SOT23-5	Tape and Reel,3000
CD8531AS8	-40°C~125°C	SOP-8	Tape and Reel,2500
CD8531AS8-RL	-40°C~125°C	SOP-8	Tape and Reel,3000
CD8531AS8-REEL	-40°C~125°C	SOP-8	Tape and Reel,4000
CD8532AS8	-40°C~125°C	SOP-8	Tape and Reel,2500
CD8532AS8-RL	-40°C~125°C	SOP-8	Tape and Reel,3000
CD8532AS8-REEL	-40°C~125°C	SOP-8	Tape and Reel,4000
CD8532AMS8	-40°C~125°C	MSOP-8	Tape and Reel,3000
CD8532ATS8	-40°C~125°C	TSSOP-8	Tape and Reel,2500
CD8532ATS8-RL	-40°C~125°C	TSSOP-8	Tape and Reel,3000
CD8532ATS8-REEL	-40°C~125°C	TSSOP-8	Tape and Reel,4000
CD8534AS14	-40°C~125°C	SOP-14	Tape and Reel,2500
CD8534AS14-RL	-40°C~125°C	SOP-14	Tape and Reel,3000
CD8534AS14-REEL	-40°C~125°C	SOP-14	Tape and Reel,4000
CD8534ATS14	-40°C~125°C	TSSOP-14	Tape and Reel,2500
CD8534ATS14-RL	-40°C~125°C	TSSOP-14	Tape and Reel,3000
CD8534ATS14-REEL	-40°C~125°C	TSSOP-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	